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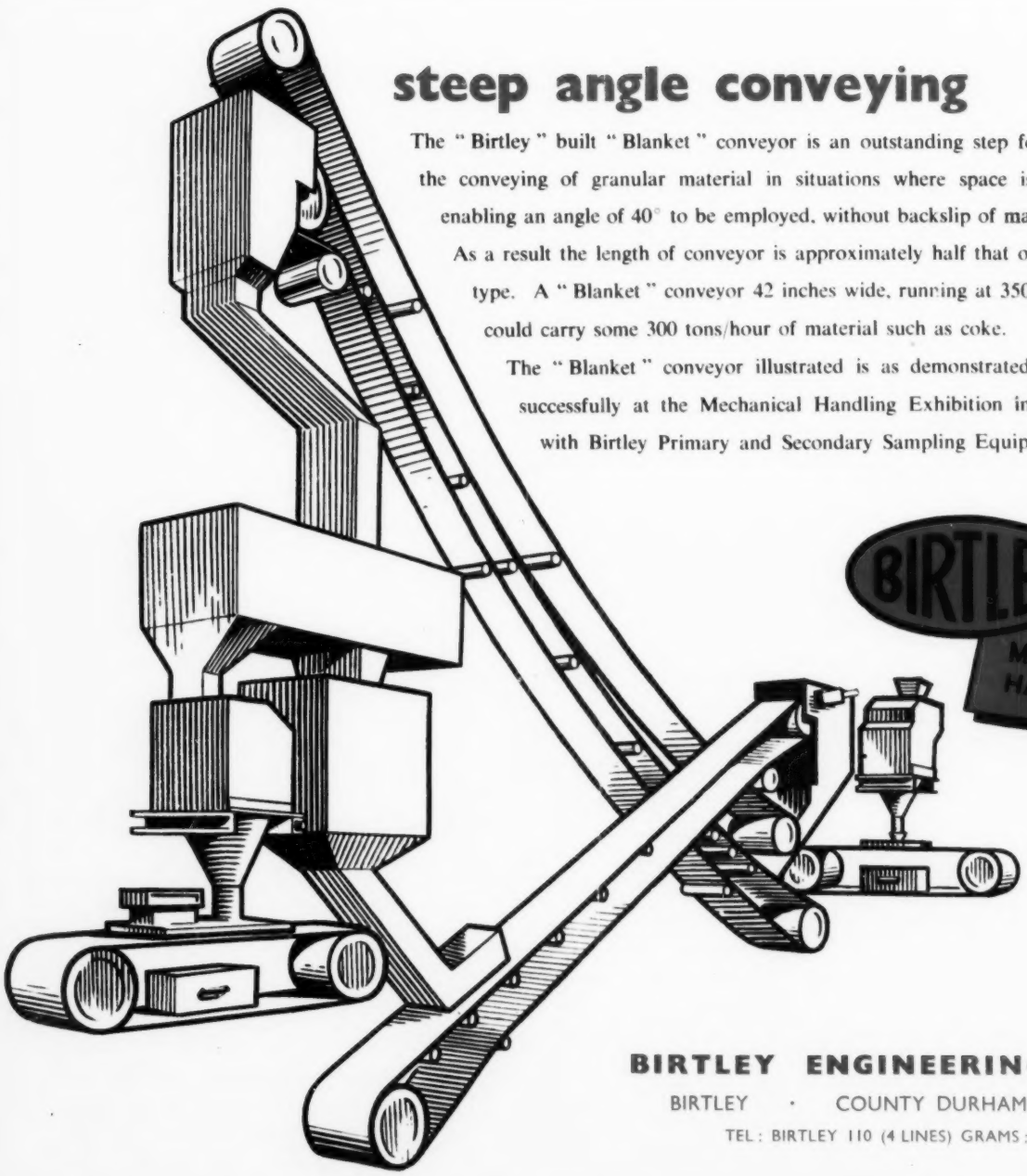

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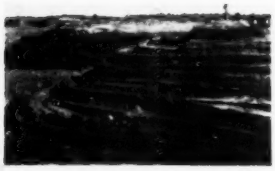

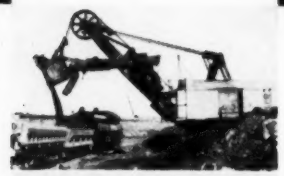

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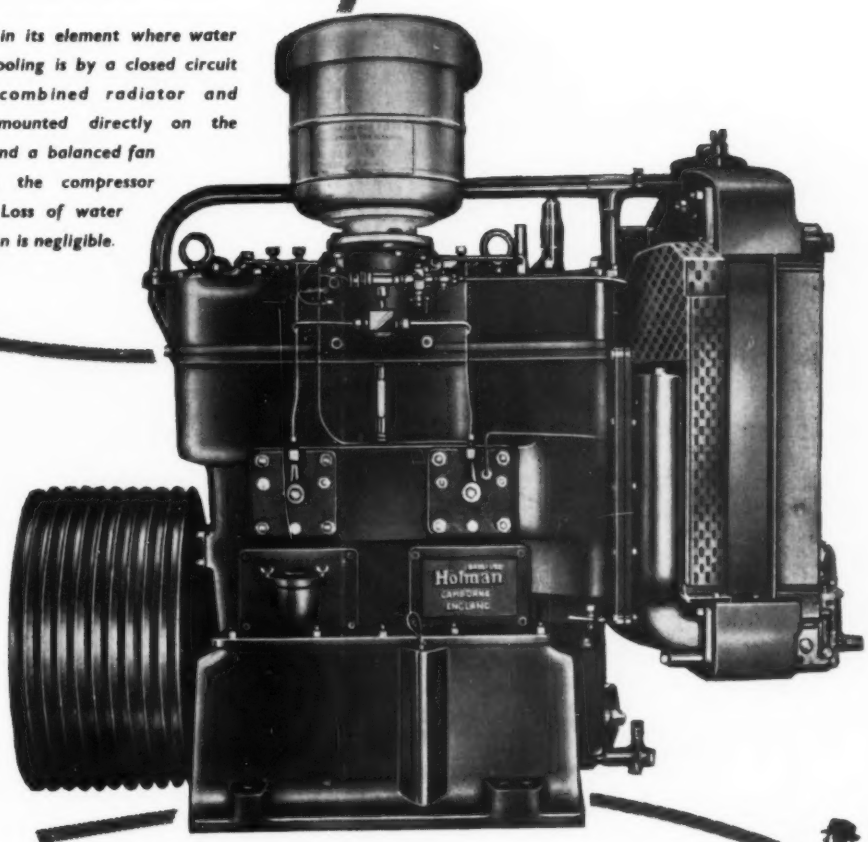

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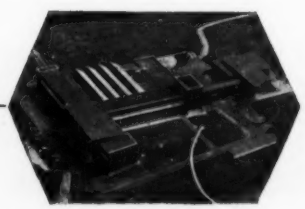

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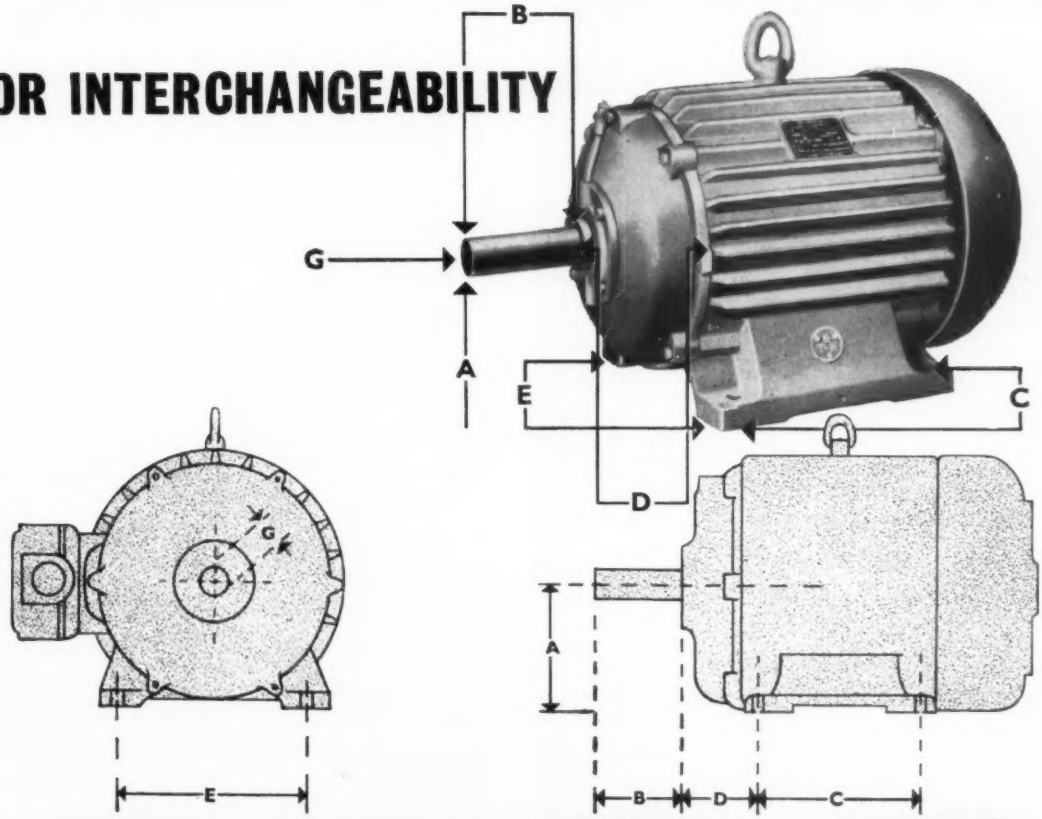

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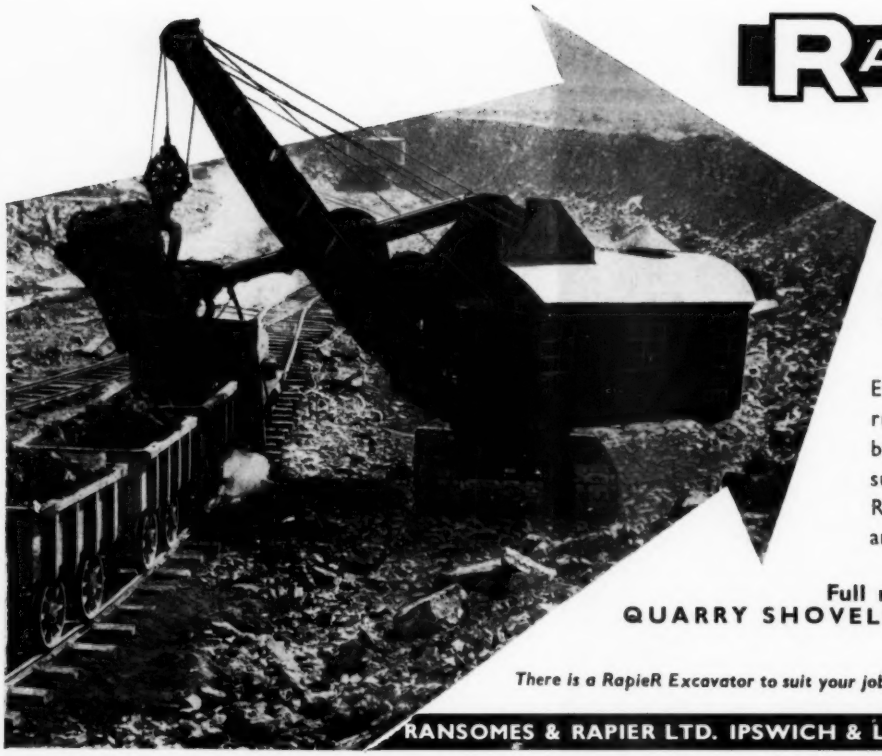

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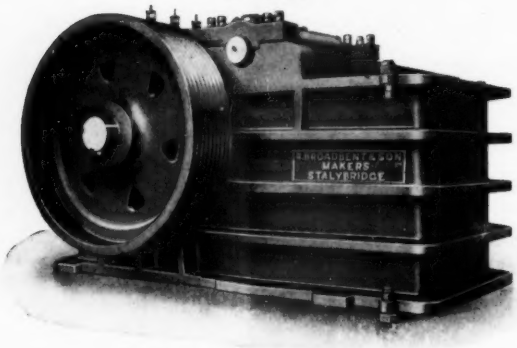

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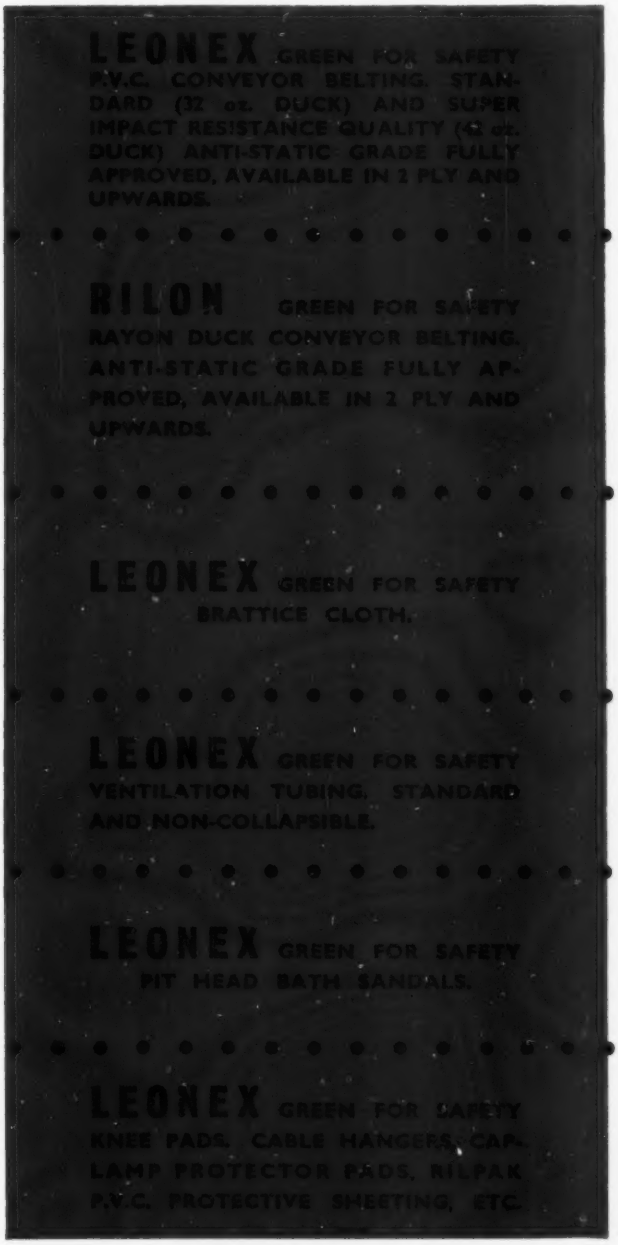
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The Mining Journal

London, December 21, 1956

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Making Uranium Honest

AFTER agreeing with Britain and Canada to make public a wide range of secret material ranging from ore production to the operation of nuclear electricity reactors, the Atomic Energy Commission has disclosed that the U.S. is producing uranium concentrate at the rate of 8,000 tons a year. This is double the rate at the beginning of the year. The estimated production for 1956 is 6,000 tons of uranium oxide. A ton of oxide is equal to about 1,700 lb. of uranium metal. The uranium oxide production came from an ore output of 3,000,000 tons for 1956.

As of November 1, U.S. domestic ore reserves totalled 60,000,000 tons, compared with 1,000,000 tons of known reserves in 1948.

The Federal Government of Canada has announced that the Dominion's known reserves of uranium ore are estimated at 225,000,000 tons with a uranium content of 237,000 tons. Canadian uranium production as at December 31, 1956, will be at the rate of 3,300 tons per year. This production will be contained in a high-grade concentrate. The rate is expected to increase sharply in 1957 and by mid-1958 it is estimated that Canada's production of uranium will be between 14,000 and 15,000 tons per annum, yielding a gross income of approximately $300,000,000.

Only a few hundred tons a year will be required for Canada's own atomic power programme over the next few years. The rest will be available for selling to other countries or for stockpiling in the Dominion. Canada is at present exporting uranium ore only to the U.S., but reports in the Canadian Press state that it is expected to start shipments to Britain, Japan and other free world countries.

The total free world output of U_3O_8 is expected to exceed 30,000 tons annually upon completion of the projects currently under way. For some time past it has apparently been quite in order for data regarding the operations of individual uranium producers to be published in the U.S. and Canada. In South Africa, however, where there are now no fewer than 29 mines officially scheduled for uranium production, the official secrecy regulations have hitherto prohibited disclosure of such mining data as the grade, reserves, and tonnages of uranium likely to be handled. But this week the South African Minister for Mines has stated that uranium producers in future may announce information concerning ore reserves, grade, and details of production since July 1, 1955.

Uranium's debut in its new and less inhibited rôle coincides with spectacular developments in the field of nuclear power generation, whereby a large and expanding demand for atomic fuels is assured for many years to come.

The first full-scale commercial nuclear power station contracts to be awarded in the world have been placed by the Central Electricity and the South of Scotand Electricity Boards with U.K. firms. Negotiations for a fourth nuclear power station are currently taking place. The four stations will cost £155,000,000 and will have a total net electrical generating capacity of 1,160 megawatts. They will generate quantities of electrical power equivalent to that produced by about 3,750,000 tons of coal a year.

Yet these three huge contracts are but the start of a "tremendous" investment programme to which the British government is committed. Mr. Geoffrey Lloyd, a former Minister of Fuel and Power, stated this week in Parliament that if the present atomic energy electricity programme were trebled by 1965, it would mean an output equivalent to 18,000,000 tons of coal. To do this would mean an expenditure of some £700,000,000-£720,000,000 in the next nine years.

In the U.S. privately-owned and publicly-owned utilities have so far announced plans to build 18 atomic power plants at an estimated cost of $425,000,000 to produce more than 1,000,000 kW. of electricity. These plants are scheduled to start generating power between 1959 and 1962.

As an indication of what the British and American programme mean in terms of uranium consumption, the U.S. Atomic Energy Commission can be cited as stating that, if there were some 78,000,000 kW. of nuclear electricity capacity installed by 1975, the atomic power industry would need anywhere from 4,000 to 15,000 tons of uranium oxide to fill its needs. This takes into account several types of reactors, some of which produce new fuel as they burn up uranium.

In assessing future uranium needs, it should be borne in mind that the success of Calder Hall is likely to result in the very rapid extension of nuclear power generation to other countries. The Portuguese government, for example, has recently purchased a site for a nuclear station.

Taking into account the very large potential market which exists in the field of commercial power generation alone, it seems evident that the uranium industry has little cause to fear the once formidable bogey of over-production, even if military orders are drastically reduced.

Looking further ahead, control of the fusion process will eventually provide the means of producing cheap electricity without the use of uranium or other radioactive fuels but the demand for uranium is unlikely to be affected by this potential source of low-cost power. Judging by the views expressed at a recent meeting of the American Nuclear Society scientists have no doubt that the power of the hydrogen bomb process can be harnessed for electricity generation, but it is considered that success is still some distance off. Even when the engineering problems have been overcome, there must inevitably be a considerable time lag before fusion power can be extensively employed. By that time the world's power requirements will have enormously increased.

According to Mr. Richard F. Post, a U.S. government scientist, economically competitive fusion power is still a long way off. Mr. Post calculates that in a hundred years the world's energy demands will be a thousand times larger than they are to-day. At that rate of consumption the present supplies of coal would last three years; oil two months, and uranium and thorium, used as nuclear fuel, 25 years. On the other hand, the supply of hydrogen which could be used in the fusion process would last a billion years.

COPPER—THE BROAD PICTURE

In an article in a special supplement of the *Financial Times* Sir Ronald Prain makes some forecast of future world output of virgin copper. Except that he has little to say on price the article is in many ways a revision of the articles he wrote in the same paper in November, 1955. It is interesting to notice the changes he has detected in the past year and the changes in his own estimates of the future. As usual he has divided world copper producers into four groups: first, the producers of copper as a by-product whose costs are relatively immaterial; secondly, the copper produced in nationalistic economies where costs are secondary to maintaining the national plan; thirdly, the world's big copper producers; and fourthly, the marginal producers in small mines. In 1955 he allocated world output to these groups in the following respective proportions —10 per cent, 12 per cent, 72 per cent and 6 per cent; to-day he re-allocates these proportions as follows—10 per cent, 9 per cent, 76 per cent and 5 per cent. The costs of the big producers still range—as they did in 1954—from £80 to £240 a ton (short); the biggest single cost bracket is still that of the mines with costs of between £120 and £140 a ton but whereas in 1954 they accounted for 25 per cent of world output they accounted for only 17 per cent in 1955. This is, as Sir Ronald says, a significant trend in mine costs though the margin at present world prices must still be judged fairly handsome.

In considering the future of world output Sir Ronald has very appreciably raised his sights compared with a year ago. He has given a much more optimistic forecast particularly for the years 1957-60. A year ago he put the addition to world supplies in this period at 160,000 a year: he now puts it at 268,000 tons a year. That gives him a projected world output of 3,869,000 tons in 1960 and of 4,089,000 tons in 1961. The bulk of this increase will come from Africa and Central and South America which will raise their respective capacities between 1956 and 1961 from 806,000 to 1,050,000 tons and from 665,000 to 925,000 tons. Between 1947 and 1955 the North American share of world output fell by 3.7 per cent; between 1955 and 1961 it will decline by a further 4 per cent which should bring it to no more than around 40 per cent. This is support for Paley with a vengeance. But the estimates of American output show how much Paley underestimated the North American potential (even granted that the figures Sir Ronald gives presumably include Canada). North American output is expected to be over 1,690,000 from 1958 onward although it is significant that there is no increase in output right up to 1961. Yet the fact remains that the United States will be *consistently* maintaining output at levels well above those which Paley believed possible only for limited periods.

Finally, Sir Ronald has something to say on Russia. He believes Russia will be a net importer of copper in the next few years. Undoubtedly he is right. Russia is known to be a country of vast mineral wealth and statistics of her output are almost entirely lacking. Yet the significance of the drive to raise living standards *in the immediate future* is being very much ignored in metal circles. In respect of both tin and copper Russia may well be an importer on a scale which will very significantly affect world markets. Geological discovery may alter this forecast; but it seems to be a reasonable one for the next decade or so.

STEEL AFTER SUEZ

The impact of the reduction in oil supplies extends far beyond the shores of Britain. In greater or less degree industry throughout Western Europe is adversely affected, although in this country the disastrous consequences have been immeasurably accentuated by the grave economic crisis which was first disclosed to a shocked House of Commons last week. A slow-down in the tempo of production, a sharp rise in prices, and a reduction in personal

and national spending power are amongst the inevitable consequences.

As in the U.K., so also in the modernized plants of Western Germany, steel being the biggest user of heavy oil fuel, must bear the full brunt of the reduction of supplies.

Stimulated by the progressive shortage of coal for industrial purposes, the steel industry's oil consumption has been steadily rising in recent years. Last year it amounted to 1,400,000 tons and this year it has been running at the rate of more than 1,500,000 tons. Under the rationing scheme British steel will have to make good a deficiency in oil of about 12,500 tons a month and this has been chiefly accomplished by the extended use of creosote pitch. Last year the industry used 312,000 tons of this fuel and it is expected that this rate of consumption will be doubled during the next few months.

Under these circumstances, the industry has done well to avoid a disastrous drop in production. None of the steel furnaces have yet been laid idle through lack of fuel and rolling mill capacity is fully employed.

Much more serious is the prospect of a steep rise in iron and steel prices. Only seven months have elapsed since the last revision of the controlled selling prices was undertaken by the Iron and Steel Board and on that occasion an average increase of £2 per ton was authorized. But the rising trend of producers' costs has since been accelerated. Wages have been advanced, coal is dearer, and it is estimated that the new oil prices will add a further £5,000,000 to the steel industry's fuel bill.

A still more serious burden is the dearth of shipping for iron ore transport and the unprecedented inflation of freight rates. Quoted rates for iron ore cargoes from the east coast of India to the Mediterranean have increased from 135s. before the crisis to 226s. 6d.

That, no doubt, is an extreme instance but from all the overseas sources of supply freight rates have risen steeply and even if the Canal is quickly re-opened for traffic there is every likelihood of extreme pressure on dry cargo space for the greater part of next year.

This experience vindicates the decision of British steel interests to embark upon a long-term programme for the building of a large fleet of specially designed ore carriers. But of the sixty vessels originally ordered only a dozen are as yet in service and the industry is still vulnerable to the fluctuations of the freight market.

Only the extent of the rise in British steel prices and the operative date remains in doubt, and current opinion is that a decision may be announced before the end of the month.

Exposed to similar conditions, German steel prices have already been advanced and a further rise is not improbable since Mr. Rene Mayer, President of the European Coal and Steel Pool has already given warning of a mounting coal shortage which will necessitate the import of 30,000,000 tons in 1957, chiefly from the U.S.A.

No such afflictions embarrass the American steel makers. They have no worries concerning coal, ore and scrap supplies and for eleven consecutive weeks dating from September 10 steel operations were running above capacity. Nor is there any weakening of the demand. Indeed, requirements for plates, structural shapes, and pipes for oil and gas lines cannot be fully satisfied.

This effort to keep pace with the swollen requirements of American industry has produced its own nemesis. Capacity has been over-strained. There have been a number of interruptions through the break down of plant and for this reason alone production has undergone a slight recession.

Confidence in the future, however, is unimpaired. An authoritative estimate of American steel expansion indicates "a probable increase" of 50 per cent in the next 20 years and a further increase of 25 per cent in the next ten years.

Where will they find the money? Even in the land of the "Almighty Dollar" this is becoming a challenging problem. It is disclosed that the accomplishment of a 40 per cent increase in U.S. steel capacity since the war, the total capital investment has been increased by 110 per cent and constructional costs are still advancing.

U.S. steel spokesmen advance the suggestion that profits are too low! That prices should be raised, not to increase dividends, but to provide the capital for that further expansion of capacity which is essential to the industrial needs of the community.

CHINA'S EXPANDING COAL INDUSTRY

The extensive mechanization projects now under way in China are giving even better results than was anticipated. It is expected that the target of 113,000,000 tons set for 1957 will be achieved in 1956, this representing an increase of some 20,000,000 tons over last year's output. The rising fuel requirements of Asia's industries furnishes the basis for significant expansion of the coal trade in this part of the world, and in this respect China is on a good wicket. Indigenous coal deposits are extensive and there is no lack of labour potential. Indeed, in theory, provided capital is available to maintain the present rate of modernization, China's coal industry could be developed in time to that level determined by the demands of the home and export markets.

Although details are not available it is known that O.M.S. is substantially greater than at the start of the new regime. Over the past few years, China's coal has developed large markets in Pakistan, Japan and Asiatic U.S.S.R. Russia presumably takes China's coal for her Siberian industries and railways. At the moment China is only exporting some 2,000,000 tons per year, but it is certain that this figure will rise appreciably as development proceeds. China's coal can be supplied to Asiatic countries much cheaper than that from Western sources and a recent substantial contract concluded in Pakistan went to China who quoted $23 per ton c.i.f. Karachi, as against the lowest U.S. bid of $29 per ton.

Japan, of course, is the ideal market for China's coal, as not only are the two countries in relatively close proximity but Japan is, in turn, anxious to develop a Chinese market for her manufactured goods. A recent trade agreement between the two countries calls for the export of 550,000 tons of Kailan coal to Japan.

"The Mining Journal" sends to all its readers everywhere best wishes for a Happy Christmas and a Prosperous New Year.

Block Development at the Kelley Mine, Montana

THE purpose of block development is to prepare the ore for extraction. When an all-gravity system—the simplest form of block caving—is employed, design is governed by company experience in other mines and experimental operations under local conditions.

In general, a block is a self-contained production unit of one or more panels. A panel, the smallest mining unit, represents an area served by one grizzly drift over one haulage crosscut. At the Kelley mine a panel is a rectangular block 80 ft. by 30 ft. in horizontal section. The 80-ft. length was considered to be the minimum safe span over which the rock would cave freely ; 16 and 20 ft. factors of 80 are close to the most feasible minimum and maximum distances of grizzly spacing. The 30-ft. panel width is a well balanced distance for spacing grizzly drifts and is a multiple of the car length—10 ft. With crosscut chutes 30 ft. apart the 30-ft. panels allow train loading from several chutes at the same time and repeated loading by moving the train 10-ft. lengths.

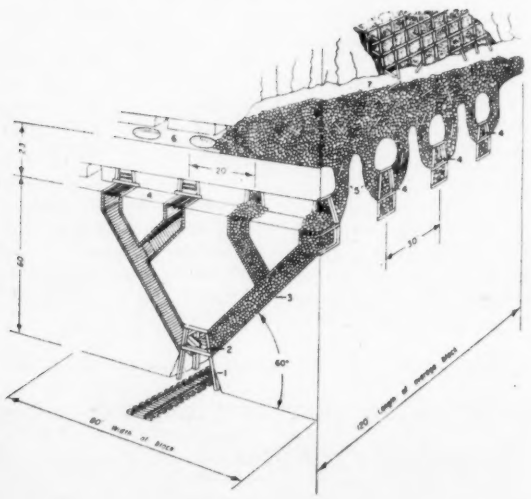
The most desirable active area for caving from the standpoint of rapid mining and maintenance was found to be 80 ft. wide and 120 or 150 ft. long, or a multiple of 4 or 5 panels. The 80-ft. by 120-ft. block is considered standard.

The size of the block depends on the size and shape of the ore body. In narrow zones a single block may contain one to four panels from the foot to the hanging wall. In wide or irregular ore zones two or more "standard" blocks may be plotted across the width of the ore zone and mined simultaneously ; double block areas, however, require more maintenance.

In general, each block has one or more sides exposed. In a block surrounded by four solid sides little maintenance of the workings is required and the dilution problem is insignificant.

Block Planning and Development

The principal objective of block planning is to lay out the panels and blocks in such a manner that they cover the ore zone with a minimum number of mining units. For this purpose a 50-ft. scale map showing the ore boundaries, the average strike, and other pertinent data on each level is prepared. First the ore zone is divided into portions by plotting the length of the panel, 80 ft., along the strike of the zone and by plotting the haulage crossscuts for each portion across the zone. Cross sections are drawn through each crosscut showing the vertical height of the zone ; the 30-ft. dimension of the panel is then applied to cross sections to satisfy, as well as possible, the principles of efficient ore drawing and the minimum ore-column requirements for the grade in place. Tonnage and grade estimates are made and recorded for each section in the form of special charts.



The all-gravity system of block development, showing 1, haulage crosscut ; 2, haulage chute ; 3, completed raise structure ; 4, grizzly drifts ; 5, finger raises ; 6, undercut level, and 7, early stage of caving after pillar extraction.

Block development is carried out from haulage levels and consists of haulage crosscuts, main raises placed at predetermined intervals and extended to grizzly level, grizzly drifts, undercut and fringe drifts, and removal of pillars. This last stage of pillar removal between the undercut drifts removes the support and creates an arch having the dimensions of the block. Ore drawing then causes the arch to fail in tension.

A height of 60 ft. between haulage and grizzly levels is considered sufficient to protect haulage drifts from excessive weight. All grizzly drifts are 100 per cent. supported. Concrete support, first introduced in the spring of 1953, was found highly successful and is now widely accepted for new blocks.

Main raises are driven from the haulage level to the grizzly level on a 60 deg. incline. Together with branch raises, the system forms openings 20 ft. apart on the grizzly levels.

The finger raise system—two raises for each grizzly—is driven in a plane normal to the grizzly line and connecting grizzly and undercut levels. The raises are 4-5 ft. in diameter ; the top half is belled in the form of an inverted cone with sides sloping 60 deg., while the base—the drawpoint—is about 16 ft. in diameter at the undercut level. The drawpoints are prepared during undercutting. Each one serves 300 sq. ft. of undercut area.

Undercutting and Pillar Removal

The ore is undercut to create roof weakness that causes caving. Efficient undercutting requires minimum ground support and minimum mucking. As a result of extensive research by the company, many improvements have been made in the original procedure. The most important improvement in undercutting was the introduction of push-feed drills to replace stopers. It was found that although push-feed drill speed (26.3 in. per min.) was nearly 45 per cent slower than stoper-drill speed (37.9 in. per min.), the overall efficiency of labour was more than twice as great because of lower labour fatigue and because of the convenience in use of the machine.

Based on a Bureau of Mines technical report issued by the U.S. Department of the Interior as "Information Circular 7758" this article describes systems of block development used by Anaconda at its Kelley Mine in Butte, Montana. The main features of Anaconda's Greater Butte project were outlined in an article published in our issue of December 14, 1956.

The pillars, 15 ft. wide, are removed in retreating operations by drilling rounds in herringbone pattern from undercut drifts and blasting the holes with dynamite. The removal proceeds as fast as possible. Inspections are made after each round to ensure that no pillar left on the level will throw excessive weight on the workings below.

Labour output and time studies of pillar extraction show that a crew of two men averages two 400 drill-foot rounds per shift and produces an average of 70 sq. ft. of pillar extraction per man shift.

Slusher-Gravity System

The advantages of concrete support for block development made tests with a combination slusher-gravity mining system a success. Consequently, this system is being used on an ever-increasing scale above the 600 level and exclusively in the 1,300 level.

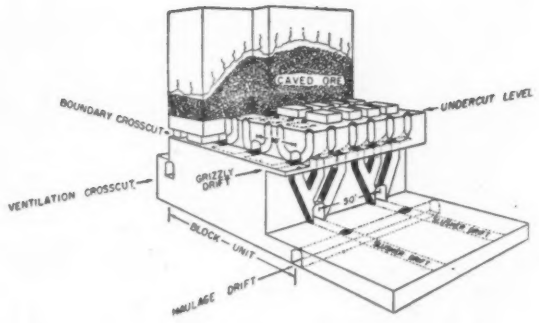
In this system the caved ore moves by gravity to the slusher drift, driven below the grizzly level, and the ore is transported and loaded into cars by scrapers. The undercut-stope area served by one finger is 240 sq. ft. in the slusher-gravity block compared with 300 sq. ft. in the all-gravity system. The slusher drifts, driven above the cap and normal to the haulage drift, and the grizzly level drifts are concreted to support the overlying ore and to resist the wear and tear of rock pounding and blasting.

The slusher-gravity system is more efficient because it allows a higher rate of production. Ore is fed from the grizzly level through shorter raises that are less apt to hang up and are more easily freed when plugged. Chutes and chute gates, with their costly repairs, are eliminated. Car loading by scrapers is uninterrupted by maintenance on the grizzly level or in raises, proceeds with less spillage, and, in general, is controlled more easily. Closer spacing of drawpoints allows more rapid and uniform drawing, better handling of wet, sticky ore, and probably, better overall ore extraction. Larger ore can be handled by this system, permitting wider grizzly spacing.

Concrete support of workings permits development to be carried on without danger of timber decay and failure many months before drawing. Tramming, handling, placing bulky timber, and expensive timber maintenance are eliminated. Concrete lining of slusher drifts provides better ventilation, less fire and dust hazards, and less damage from blasting and boulder blows in comparison with timber-supported workings in the all-gravity system. Labour efficiency increases considerably. The output per man-shift has risen from 45 tons to 97.

The slusher-gravity system has been used successfully where the all-gravity system was unsatisfactory; e.g. in a double block area (160 ft. by 120 ft.) or in a block lying between the foot and hanging walls and adjacent to depleted blocks on two sides.

The standard concreted, slusher-drift is 9 ft. 4 in. high and 7 ft. 3 in. wide. Present practice is to use 2-drum electric slushers with a rope pull of 9,900 lb. and a speed of about 250 ft. per min. The bucket is 60 in. wide. Total shift production is 500 to 700 tons per slusher drift.



A slusher-gravity block, showing a three branch raise design.

In the early design of a slusher-gravity block slusher drifts were parallel to the grizzly drifts, raises were driven upward on a 60 deg. angle, and the finger raises were nearly vertical. The design was later modified to eliminate packing in main raises; the interval between grizzly and slusher levels was shortened and a vertical section under grizzlies was added to the main raises. In a third type of block design slusher drifts are transverse to the grizzly drifts, grizzly intervals are 20 instead of 30 ft., and special crosscuts are added for ventilation. In a more recent design, three branch raises provide better draw control, the slusher drifts are 50 ft. apart and transverse to the grizzly drifts, and ventilation crosscuts are again provided.

Tests are being made with a new design in which slusher drifts are 30 ft. apart and there are no grizzly drifts.

Ore Drawing

Ore is drawn from fingers at whatever uniform rate will achieve maximum ore recovery with minimum dilution. This rate fluctuates during the life of the block and is controlled mainly by the caving behaviour and physical character of the ore. Time is allowed for caving to take place after undercutting. Thereafter, drawing is kept at a curtailed rate to get good caving action, so that the broken ore will neither fail to support the caving ground and stop the sloughing nor leave excess open space in the stope. In subsequent stages caving proceeds at a fast rate and the speed of drawing may be increased according to production needs.

The general procedure is to draw uniformly from all fingers and to decrease the rate of drawing from raises in which dilution appears.

In the final stage drawing is slowed considerably because of increased dilution from capping and adjoining exhausted blocks and the necessity for grade control by sampling.

At the Kelley mine the daily ore-drawing rate averages about 1 vertical foot per production day in terms of ore in place. In practice it varies from less than 1 to more than 2½ ore-column-feet per day, equivalent to less than 20 to more than 50 tons of ore per finger per day. Rapid drawing is practical chiefly because of the semi-broken character of ore bodies owing to previous mining.

Indicative of the higher productivity of block caving, as compared with other methods used for copper mining at Butte, is the fact that in 1954 the overall output per man-shift for the Kelley mine reached nearly five times that of other mines at Butte.

The Effects of Full

IN order to estimate what effect full mechanization and automation would have on the labour and cost structure of a South African gold mine, we propose to take the case of a hypothetical mine which is typical of partly mechanized conditions as they are at present, and to compare it with the labour requirements and the cost structure for the same mine producing the same tonnage under fully mechanized conditions.

The following tables give the main outline of the hypothetical mine operating under the two conditions.

Production Teams

	Present Conditions	*Fully Mechanised*
Tons milled/month	100,000	100,000
Stoping—		
No. of main crews	60	13
No. of auxiliary crews	—	4
Development—		
No. of main crews	15	3
No. of auxiliary crews	—	3
Footage advanced/month	3000	3000

In the fully-mechanized unit, the 13 main stoping crews will include one complete spare crew in training from which very little output is expected. The auxiliary stoping crews will be occupied in less highly mechanized mining, preparing stopes ahead of the main crews and in cleaning off small pieces of ground unsuitable for stoping by the main crews. The same principle applies to the development crews: main ends will be advanced by the main crews and subsidiary and minor development for stoping by the auxiliary crews.

Underground Labour Distribution (at work)

	Present Conditions		*Fully Mechanised*	
Occupation	*White*	*African*	*White*	*African*
Stoping	80	1600	30	350
Development	25	300	6	60
Transport and haulage	15	140	4	40
Shafts and hoisting	25	90	15	50
Capital work	15	120	10	100
Engineering	50	260	50	150
Other Services	55	230	20	60
Supervision	45	150	20	60
Sundry	10	110	5	50
Total	320	3000	160	920

This table shows the underground labour forces required, divided into the principal occupations. The mechanized stoping complement will include the 12 main production crews with two Europeans and 20 Africans each. The same number of Europeans on the engineering staff has been allowed in each case. In the mechanized layout there will be considerable savings in the engineering department, in pumpmen and hoist drivers and in the concentration of work, so that additional numbers will probably not be required although there will be an increased proportion of artisans. Because of the complete concentration of work, it will be possible to cut down drastically on all other services. It is probable that the complements suggested for the fully mechanized set-up still err on the liberal side.

Surface Labour Distribution (at work)

	Present Conditions		*Fully Mechanised*	
Occupation	*White*	*African*	*White*	*African*
Crushing and Reduction	45	200	20	80
Compounds	5	200	3	60
Administration	50	80	15	20
Hoisting and Haulage	35	100	17	60
Engineering	100	200	80	160
Other Depts.	45	220	15	90
Total surface	280	1000	150	470
Total surface & underground	600	4000	310	1390

The table shows the surface labour force required, in a similar manner. The best and newest reduction plants are already working with complements approaching that allowed for in the fully mechanized condition. The cut in the engineering complement is accounted for by the reduction in maintenance on buildings, and by the complete concentration of work underground. This should result in savings more than compensating for the additional machinery employed—if indeed the total of machinery and equipment employed proves to be any greater than is at present spread throughout the working places in a normal mine. In other departments, the saving is mainly due to the large cut in the total numbers employed, and the reduction in the administrative department also assumes central, mechanised accounting and computing.

Overall, it will be seen from the surface labour distribution table that in a fully mechanized unit the European labour force will be reduced from 600 to 310 and the African from 4,000 to 1,390 people at work.

Total Direct and Indirect Wages per Month
(Based on men in service)

	Present Conditions	*Conditions Fully Mechanised*
White	£75,000	£42,000
African	£40,000	£21,000
Total	£115,000	£63,000

The table above shows a comparison of the total wages bill, direct wages, wages in kind and other benefits. The net saving for full mechanization would be over £50,000 a month; and the totals in the table for the mechanized mine allow for a generous increase in the average direct

This article concludes our extracts from the paper entitled *The Possibilities of Full Mechanization and Automation in Mining* which was recently read before the South African Institute of Personnel Management. The authors are respectively Professor of Mining at University of the Witwatersrand and a member of the staff of that department. The extracts published in the first article, which appeared last week, reviewed the extent to which it seemed technically practicable to introduce mechanization and semi-automatic processes into South Africa's gold industry. This week's extracts are concerned with an assessment of the likely capital cost and extent of the saving in labour which might reasonably be expected to result from full mechanization. As the authors are, to a large extent, breaking new ground in their paper, they are obviously lacking precisely comparable cost and manpower figures on which to base their estimates. In these circumstances the last table in the article (comparing theoretical savings in the gold industry with authenticated data from South African coal mining) is of particular interest. In estimating the likely capital cost of mechanization the authors would seem to have based their figures on known costs of similar coal mining equipment and then to have allowed a considerable margin on top of that. Given the degree of mechanization to be introduced, underground labour complements are fairly readily calculable, and we would imagine that as regards surface labour enough experience exists of, for example, factory office mechanization or of process plant used in uranium recovery for the authors to have been able to make a fairly accurate calculation of labour requirements.

Mechanization on Labour and Costs in S. African Mines

European wage and a doubling of the direct wage in the case of the African workers.

Other savings would, of course, also follow from full mechanization. Using hydraulic props or chocks would save about £4,000 a month on timber on the direct cost of the timber. Transport and hoisting and lowering of men and material (mainly timber) would be greatly reduced, and there would be considerable savings in all sorts of stores and equipment resulting from the concentration of work underground. But without going into great detail it is not possible to estimate what these savings would be. It is probable that they would roughly balance out with increases in other directions, particularly in power consumption.

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and
TOM EDWARDS

However, the savings from wages alone would amount to £600,000 a year; and, in the case of a new mine, the reduced labour force would result in reduction in capital expenditure on housing, compounds, offices and change houses of at least £750,000.

Looking now at the reverse side of the picture, what is it likely to cost to achieve the necessary degree of mechanization to effect savings of this order?

The first item is the research and development to find the correct equipment and methods. £5,000,000 for the industry spread over five years should provide the answers. On a pro rata basis this would cost our hypothetical mine less than £2,000 a month, or a total of £100,000, which is about two months' potential savings.

The capital cost of the equipment once it is developed is, of course, very difficult to estimate; it would, for instance, make a considerable difference if it were manufactured in South Africa. The table below is a tentative effort in this direction. It is based on the additional capital cost of automatic or additional labour saving equipment over the cost of the type of equipment at present used.

Capital Cost of Automation

	£	£
Electronic Office — 1/5 share (shared by 5 mines)		30,000
Reduction works Automation		250,000
Pumping and Hoisting Automation		250,000
Development Equipment		180,000
Stoping Equipment:		
(4 sets in full use, 1 training, 3 spare)	£	
Loading machine	20,000	
Face conveyor (armoured)	2,000	
Belt conveyors	8,000	
Mechanised Drill rigs	8,000	
Hydraulic chocks and props	10,000	
Mechanical sweeping	5,000	
Mechanical stowing	5,000	
Multi-blast ventilation and other equipment	10,000	
	£68,000 x 8	550,000
Other Automation		240,000
Total		£1,500,000

We would be the first to admit that these figures are merely tentative; there is unfortunately no comparable data to work on. The cost of the stoping equipment, the largest single item, is taken from mechanized colliery practice.

Nevertheless, the main conclusion that emerges is that for a net additional capital expenditure, allowing for the saving on building programmes, or roughly £1,000,000, it should be possible to save over £600,000 a year on wages. This is not such an enormous saving as it might at first sight appear, as much of the equipment used underground will have a short life, but the figures certainly indicate that worthwhile savings should be possible. They may prove to be much larger in practice than we have tentatively suggested. One also has to bear in mind the considerable factor that labour saving on this scale would enable all mines to work to full milling capacity and quite possibly enable them to extend capacity.

Finally, it is instructive to compare our figures for a gold mine with comparable statistics from collieries in South Africa.

Comparison Between Mechanised Mining and "Hand" Operation

	Tons milled or sold per month	*Total Labour Force*	*Labour Force per 100,000 tons of output*	*Ratio of Labour Force*
Gold Mining—				
Present Conditions	100,000	4600	4600	2.7
Fully Mechanised	100,000	1700	1700	to 1
Collieries—				
"A" "Hand" work	100,000	1063	1063	2
"B" Mechanised	55,000	300	545	to 1
"C" "Hand" work	50,000	699	1398	2.2
"D" Mechanised	50 000	316	632	to 1
"E" "Hand" work	165,000	1808	1095	4.5
"F" Mechanised	165,000	400	242	to 1

The figure shown against collieries "A" and "B" are actual figures from producing mines. Unfortunately, a comparison for two mines with similar outputs was not available. The two sets of figures "C" and "D" and "E" and "F" are derived from an article by Papendorf[1] in which, based on actual experience of both mechanized and hand-operated collieries, he compares the labour for hand-mining and machine-mining in small and in large collieries. It will be noticed that the maximum advantage of mechanization is only obtained with very large collieries. Papendorf also shows that there is a balance in favour of mechanization in terms of the return on the investment.

In the modern era governments can now exercise wide technical control over the level of employment; it would be political suicide for any government to fail to do so in the face of a threat of widespread unemployment. In addition, the prosperity of Western economy as a whole is bound up with the prosperity of its individual members. This is a powerful factor operating to ensure economic co-operation and full employment.

As far as South Africa is concerned, there is little risk in any case of "over-production"; too large a proportion of the population is still at the subsistence level, and is likely to remain there until the productivity of the labour force is raised far above the "pick and shovel" level. The danger in mechanization or automation does not lie in its long-term results, but in short-term disorganization if the changes are not introduced wisely or are introduced too suddenly.

The latter possibility, that the changes will be introduced too suddenly is not in practice likely to occur. No one supposes that long-established mines or factories can suddenly turn over to automatic production. Even in the mass-production industries overseas, the change-over has been gradual, and in mining the development of machines and methods is likely to be a slow process; but in the end, say in 15-20 years' time, we may well be counting the labour force of a big mine in hundreds instead of thousands.

Mechanization affects new mines before it affects old ones, for obvious reasons; the provision of the necessary capital is easier, the layout can be designed to take full advantage of mechanization, and labour has been very scarce in recent years for new mines. But the incentive for further mechanization in both old and new mines is very strong since few mines are at present operating at full capacity, and it is unlikely that enough labour, either European or African, will ever again be available for full production by the present methods of production.

That changes which affect labour, even if they are simple and inevitable, should be introduced only after open discussion and with the co-operation of labour does not need to be stressed to this audience. In mining in South Africa the changes that will result from full mechanization are far from simple. Fortunately, the economy of the country is expanding rapidly and there is not likely to be any shortage of employment for temporarily redundant workers; and the scale of mining itself will certainly increase if full mechanization can reduce costs significantly.

Racial and craft barriers, both formal and informal, are likely to be the chief obstacles to be overcome, and great care must be taken not to disturb the security of the workpeople at any stage. It was encouraging to see at the recent conference on automation in Pretoria that government, employers and unions alike were prepared to meet and discuss the problems freely.

Good training, high skill, adaptability and teamwork in the labour force are the conditions for success in mechanized industry. That they can be achieved quickly and efficiently was amply proved in the armed forces in the last war. To reproduce them in industry in peace-time is a more difficult problem. Traditional methods of training tradesmen and rigid division of labour between crafts will not meet the demands of mechanized production. The miner and his team between them will have to be jacks and masters of all trades, otherwise the handling and maintenance of machinery will present insurmountable problems. Communication and consultation between management and labour, selection and training of staff, training in teamwork, leadership and supervision, and the redeployment of labour, will all present formidable problems.

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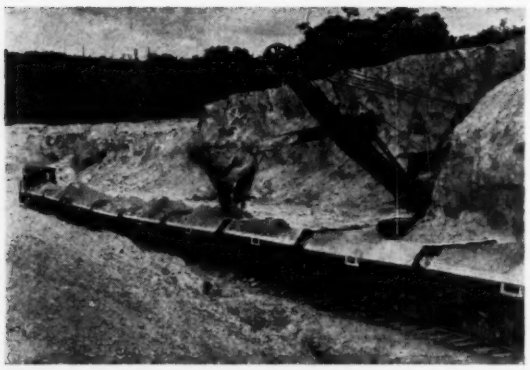
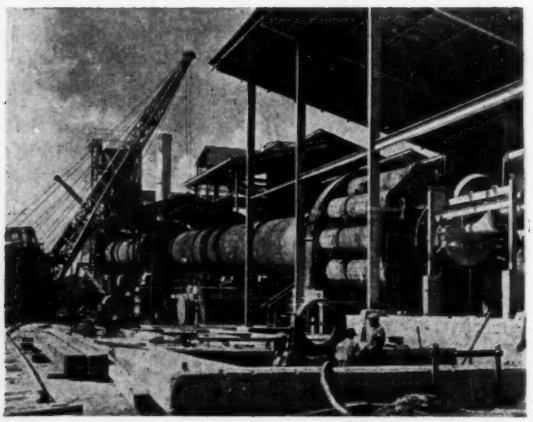
Alumina Plant for British Guiana





PLANS for the construction of important new facilities for the manufacture of alumina in British Guiana have been announced by Mr. Nathanael V. Davis, President of Aluminium Limited. Work is expected to start shortly on a 30-month construction project for a new chemical plant, with an annual capacity of 250,000 s.tons of alumina, involving the treatment of about half a million tons of bauxite from the Company's present mining installations in the Demerara river district of British Guiana.

Mr. Davis said that facilities to supply alumina or aluminium oxide were being expanded on a construction schedule designed to match the timetable requirements of new smelter construction in Canada. The decision to locate an alumina plant in British Guiana had been taken subject to the finalization of details with local government authorities; and had been influenced by the company's experience in that country with the mining and treatment of primary ores during the past forty years.

The new plant will be erected near Mackenzie, which is already one of the major bauxite centres of the industry, and will cost an estimated $33,000,000. Mackenzie is located on the Demerara River about sixty miles from the Atlantic Ocean, and the new plant site is accessible to sea-going freighters. First shipments of alumina from the new plant are expected in 1959, and will be directed mainly to growing smelter requirements in Canada.

Recent developments in the ocean transport of bulk cargoes of alumina have facilitated the establishment of alumina plants in bauxite-producing areas.

Above: Bauxite blasted by explosive charges is loaded by mechanical shovels into trains

Below: A large calcining kiln under construction at Demerara Bauxite. Kilns operate at temperatures of between 2,000 and 3,000 deg. F.

Titanium's Teething Troubles Are Over

SINCE 1948, when commercial production was first started in the U.S. on a very small scale, titanium's progress tonnage-wise has been more rapid than that of any other metal. The U.S. output has virtually doubled every year, while the U.K. and Japan are to-day producing substantial quantities of titanium metal.

Technologists and designers in search of engineering materials with new combinations of properties were immediately attracted by titanium. This material is highly corrosion-resistant. It is potentially capable of strengths exceeding that of heat-treated alloy steel, and its weight is barely half that of steel. Furthermore, there is considerable evidence that titanium can operate at high stress levels at temperatures up to 1,000 deg. F. Here was a metal which seemed ideally suitable for gas turbines, supersonic flight, high-performance aircraft, ballistic missiles, the corrosive environment of atomic installations, and the multiplicity of extreme corrosive conditions encountered in the chemical processing industries.

On the other hand, commercial development was hampered by the high cost of the metal and the complex and cumbersome method of reduction. Users were despondent about the difficulties encountered in machining, grinding, welding and forming the metal, due primarily to titanium's affinity for oxygen. When heat treated, titanium picked up an unsatisfactory scaling. In addition, titanium's inherent stiffness was practically doubled when the metal was rolled in sheet forms.

Development was further handicapped by the fact that initial applications were in the jet engine and airframe industries, where design requirements make formidable demands on materials and specifications are rigid.

Until quite recently many users were dissatisfied with the quality of titanium sponge and doubts were entertained in some quarters as to the suitability of the metal as a material for aircraft construction. Only last year there were extensive congressional inquiries into the uses of titanium, at which manufacturers indicated that, due largely to the problems arising from oxygen affinity they had not adapted the metal into as many replacements as anticipated.

Overcoming the Problems

Much progress in overcoming these drawbacks has since been made. The problems of sponge quality are now so well in hand as to be completely ignored in technical and industrial meetings. Difficulties associated with working and forming have been eliminated by a technique which allows pure titanium sheets to be economically rolled in various mill sizes with satisfactory surfaces free from mill marks and with uniform gauges. This invention, under patent to the Mallory-Sharon Titanium Corporation, paved the way for pure titanium sheet bar provided by forging or rolling from ingots.

To-day, titanium is being machined and ground in large quantities, often more easily and efficiently than steels of comparable strengths. Welding, which a couple of years ago seemed almost impossible, is now well on the way to becoming routine. Large-scale recycling of home and customer scrap is already commonplace, although late in 1954 there were still many experts who doubted whether this could ever be successfully accomplished.

At a recent meeting of the New York Society of Security Analysts, Mr. A. Martino, president of the National Lead Company, stated that the new metal was advancing towards industrial maturity with a promising future. National Lead are joint owners with Allegheny Ludlum Steel Corporation of the Titanium Metals Corporation of America—the first joint venture in the titanium industry.

Competitive Properties of Titanium

Both National Lead and Allegheny Ludlum are convinced that because of its many desirable properties titanium can become competitive with the other three engineering metals—steel, aluminium and magnesium. Now that the American government has rescinded quotas on the uses of various critical metals, it is expected that titanium will be used more extensively in the latest types of aircraft, where weight and heat remain the biggest problems. The non-military market for titanium is being energetically explored, many tests and prototypes are being made, and as prices continue their downward movement more and more of these markets will require progressive increases in titanium capacity.

Realizing that progress in the non-military field depends on prices considerably lower than those prevailing to-day, every effort is being made to reduce production costs. Thus the Titanium Metals Corporation is devoting great sums of money and much technical skill to perfecting other means of basic extraction, such as an electrolytic process. Nevertheless, the Corporation is still of the opinion—which it has always held—that the Kroll method of reduction is capable in the long-term of turning out the very highest quality of metal at quite low cost.

A 40 per cent reduction in sponge price (from $5 to $3) has been achieved by the U.S. titanium industry within two years, though I.C.I. still has the distinction of being the world's cheapest producer of titanium metal. Changes in the price of mill products inevitably lag behind, but here, too, substantial reductions have been achieved.

All these price cuts are the result of the first upward surge from laboratory to routine production of sizable quantities of metal. The industry is now entering upon a second stage of development, with total production capabilities moving to far higher levels along paths of greater efficiency and with processing of the metal being transferred to equipment specifically designed for titanium.

The very large, efficient and precise consumable-electrode vacuum-melting ingot furnaces developed by Allegheny Ludlum for melting titanium are already being adopted by the steel industry for melting premium alloys and are expected to find favour with other sections of the metal industry. The Titanium Metals Corporation is installing a $3,000,000 Sendzimir reversing cluster mill for the cold rolling of continuous bands of titanium sheet in widths up to 49 in. This is the first mill of its kind to be altered to accommodate the peculiarities of titanium.

Machinery and Equipment

High Efficiency in Dry Concentration

Dry concentration of minerals, once thought of mainly in connection with desert deposits, is becoming more widely considered in mineral dressing practice as a result of the development of new techniques. Research into the problems arising in this field of mineral treatment has been carried on for many years by Knapp and Bates and attention is being increasingly directed to dry methods where such problems as water pollution, slimes disposal and water scarcity call for minimum use of water and where dry concentration presents many attractive features.

Hitherto a disadvantage of dry concentration has been the question of dust control which usually arises but in recent years new developments here have produced not only new dust collection systems but have also contributed to new lines of thought in mineral dressing. A further disadvantage was considered to lie in the fact that a larger specific gravity ratio could be obtained with wet treatment as opposed to dry methods.

This former disadvantage, however, has been largely overcome with the development of new types of tables and jigs and currently many of these types of units are providing substantial tonnages of concentrates over a wide range of ores. In Nigeria, for example, dry tabling of tin/columbite material has been attended with considerable success for several years.

In lead/zinc concentration, operating results of a Knapp and Bates pneumatic jig have shown that 98.6 per cent of the lead and 90.5 per cent of the zinc are being recovered whilst at the same time the ore has been reduced in bulk by one-half. The installation consists of two jigs in parallel, one treating $-\frac{1}{4}$ in. $+\frac{3}{16}$ in. material and the other treating $-\frac{3}{16}$ + 10 BSS material. Jig feed, assaying a little better than 1.8 per cent Pb and 2.5 per cent Zn was derived from a crushing unit, the object of the jigs being to deliver a much reduced volume of material to the grinding circuit. Tailings values were found to be less than 0.1 per cent Pb and 0.5 per cent Zn.

The type of jig used consists of a sloping trough fitted with a porous plate at its base, the trough being suitably sprung and given a high speed, small amplitude vibration. Air, derived from a small fan, flows into a wind box under the trough and is diffused outwards through a porous sintered plate at a pressure of some 3-5 p.s.i. Feed enters through a hopper above the trough so arranged that the upper part of the trough, sloping upwards from the hopper, has a sufficient area for segregation and concentration. This is effected by the principle that the concentrates are capable of resisting the air diffusion and are carried up the slope by the vibration, whilst the tailings are kept in a state of suspension by the air diffusion and travel down the slope in a flow condition.

BRITISH "KNOW-HOW" AIDS COAL INDUSTRY

Reports constantly come to hand of developments in the U.K. coal mining industry that arise from ideas forwarded by workers at collieries in various divisions of the N.C.B. A device to simplify the lubrication of cage guide ropes has been used successfully at Oakdale Colliery, Monmouthshire, and has been developed on that property.

The device consists of a metal tube forming an oil bath through which the guide rope passes. An oil seal is provided by spring-loaded rubber sealing rings which allow the oiler to adapt itself for moderate wear of the guide rope.

When oiling is to be carried out, the oiler is fitted around the guide in a position above the cage horn and shackle. A chain fastened to the oiler and secured to the cage chain ensures that the oiler descends with the cage. The device is filled with oil, and the cage slowly descends for the whole of the winding depth, the operator topping up when necessary.

As the guide rope passes through the oiler, it is first cleaned of water and old grease by the scraping action of the device; it is then bathed in oil, any surplus oil being wiped off by spring-loaded wipers at the top end of the oiler. These wipers are so designed that the surplus oil is returned to the oil bath for further use.

At Gedling Colliery, in the East Midlands Division, an automatic system for draining water from compressed air mains, receivers and operating equipment has been devised. It involves the use of Westinghouse air valves, and has been adapted at Gedling for draining compressor intercoolers and air receivers. As the system is pneumatically operated, it can only be used when some piece of air equipment is in operation.

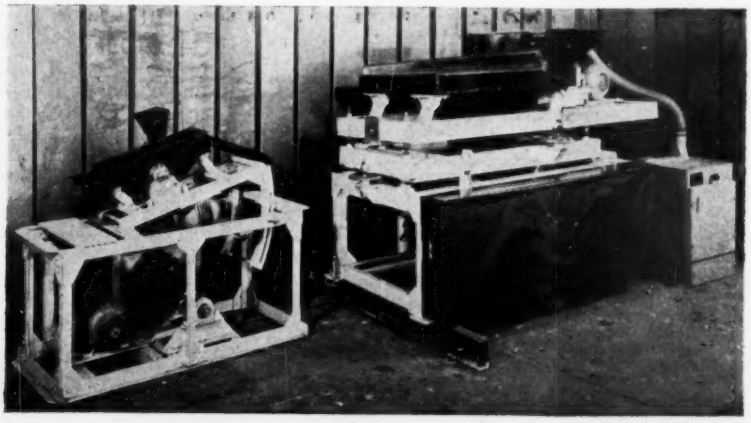
The principle is that water from the compressed air system is allowed to run into a receptacle which has an air-operated valve at the inlet and outlet. To empty the water it is necessary to close the inlet valve and open the outlet valve and this is done by taking an air supply from adjacent compressed air equipment so that when air is applied to operate the equipment it also closes the inlet and opens the outlet valve. When the system is used for draining the intercooler of a compressor, air pressure normally keeps the draining valve closed. When the compressor unloads, i.e., when idling, the operation of the unloading valve allows the air pressure to fall and the drain valve to open and the water is drawn away. When draining air receivers two valves are used and the opening and closing is done by air pressure from nearby equipment such as air doors and point switches.

There are 18 such sets in use at Gedling. When another six have been installed the whole of the colliery's compressed air equipment will be automatically drained in this way.

AIR HOSE COUPLERS IN MINING

The expenses attendant upon compressing air are very real and thus in mining leakages are of major importance, as it is said that even a pin hole in an air hose can represent a loss of £10 p.a. For this reason the connection between hose and hose and hose and plant cannot be too closely considered, and the air hose coupler manufactured by Victor Products (Wallsend) Ltd. is presented as offering efficient and simple sealing action.

In these hose couplers the rubber seal is distorted with the first movement of air and, thereafter, instant sealing follows. The bridle holds the two parts together before the air is applied and, once sealing has taken place, is locked in position. The couplers are constructed of malleable iron, and are for use on air pressures of up to 150 lb. p.s.i.



Laboratory dry jig and 27 in. by 42 in. batch dry concentrating table

MINING MISCELLANY

Slovakia is rich in magnesite deposits which, it is estimated, amount to 50,000,000 tonnes. The Five-Year Plan envisages a vast expansion of the magnesite industry.

★

The presence of limestone of potential economic importance at a depth of 627 feet has been revealed in Western Nigeria by drilling operations carried out by the Geological Survey Department.

★

Northern Rhodesia's oldest copper mine, at Bwana M'Kubwa, derilect for the last 30 years, has been re-opened to a depth of 120 ft. The aim is to probe the old shaft to a depth of 350 ft. Preliminary reports regarding the quality of copper ore so far investigated are favourable.

★

Trade returns show that among Cyprus's imports in the period January to October, 1956, was £627,000 worth of mining machinery. Of this Western Germany supplied £411,000 worth, Britain £142,000 and the U.S. £44,000. Smaller quantities were imported from Belgium and Sweden.

★

Broken Hill Pty. Ltd., of Australia, is carrying out tests on a number of rutile areas. This has been reported by directors of New Redhead Estate and Coal Co. Ltd., which operates in the Newcastle area. Some time ago the latter company decided to test some of the beach sands for rutile content. BHP was approached following a preliminary report from a mining engineer and is carrying out the tests under an agreement between the two companies.

★

It has been announced in Toronto that the current diamond drilling programme in the Allihies Copper Mines in West County Cork is making good progress with three rigs operating on the surface and one underground. As a result of the expanding ore picture being filled in by current exploration work, Can-Erin Mines Ltd. has ordered further equipment for the mining plant, which will be installed at the main shaft of the Mountain Mine.

★

The French mining company Compagne Minière du Congo Français has decided to exploit the lead deposit of Hapilo in French Equitorial Africa. The deposit is 5 kilometers from M'Fouati where the company already operates a mine. Reserves at Hapilo are considered important enough to be exploited in the form of oxidized ores, which will be transported by cable railway to M'Fouati where they will be concentrated. Production will start at the end of 1956 and will gradually replace that of M'Fouati, which is near exhaustion.

★

The Ministry of Mines, Venezuela, has announced the discovery of uranium-bearing ore in Tachira state. Samples have been sent for analysis to the U.S. Atomic Energy Commission and several were found to contain 70 to 120 grammes per ton of ore. Exploitation of radioactive materials is reserved to the State, but foreign technical and financial aid is not excluded. Findings of uranium ore in other regions have been reported from time to time but have not been officially confirmed.

★

The Uptata Mining Company, a Venezuelan/German concern established near Puerto Ordaz in Venezuela, has begun commercial operations and is shortly to export manganese ore to Germany. Extraction is said to be at the rate of 600 tons a day. This concern plans to set up a ferro-manganese plant costing 200,000,000 Bolivars to produce alloys for the steelworks at Puerto Ordaz and will employ some 2,500 workers. Equipment is being obtained from the U.S.

★

Canada is paying for almost half of a $400,000 survey being made of mineral deposits in 35,000 miles of unexplored jungle in Malaya. In announcing this contribution under the Colombo Plan, the Canadian Department of External Affairs said it was hoped that an aerial survey by Spartan Air Services, of Ottawa, would lead to discovery of important new deposits of tin as well as such other minerals as tungsten and ilmenite. This is the first major Colombo Plan project undertaken by Canada in Malaya. Malaya will share the costs with Canada.

★

The year's work by surface diamond drilling at Mount Isa Mines, Australia, has indicated further southern extensions of the orebodies and very large additions to ore reserves in this direction are expected as exploration proceeds. Exploratory work to the north has also indicated great possibilities in that direction. To develop these resources and to bring them into production will call for the expenditure of about £A20,000,000 in the next five years. At the present time, the company is planning a big housing and amenities programme, which must precede expansion, as well as general mine development and exploration, which will include the development of the important Northern Leases, together with work at the south and, in addition, the construction of the copper refinery at Townsville.

PERSONAL

Mr. E. H. Browne has been elected president of the Institution of Mining Engineers for the year 1957-58.

★

Mr. A. T. W. Paine has been appointed chairman of Burma Mines Ltd. to succeed the late Mr. J. R. Govett. Mr. D. S. Middleditch has been appointed a director of the company.

★

Mr. L. A. Lewington has been appointed a director of the Mazapil Copper Co. Ltd.

Mr. L. J. Bussey has been elected a director of Paringa Mining and Exploration Co. Ltd.

★

Mr. H. Ronald Connor has been appointed secretary of the New Consolidated Mines of Cornwall.

★

Mr. H. G. Ivatt, general manager of Brush Traction, retired on December 1, but will remain on the board. Mr. F. H. Wood has been appointed manager

★

Mr. B. Chad Smith has been appointed assistant general manager of the Warwickshire Area of the West Midlands Divisional Coal Board as from April 1. For the past 18 months he has been deputy marketing director of the Division.

★

The Institution of Mining Engineers has announced the following awards: the Douglas Hay Medal to Mr. H. R. King in recognition of his outstanding contributions to the *Transactions* over a period of many years; the Maskell Peace Scholarship of £70 for 1956 to Mr. A. H. H. Campbell, a student at the Joint Mining Department of the University of Edinburgh and Heriot-Watt College; and the Sam Mavor Students' Prize of £20 to Mr. C. Fairhurst for his paper entitled "Some Possibilities and Limitations of Rotary Drilling in Hard Rocks" (*Trans. Instn. Min. Engrs.*, 1955-56, *115*, 85).

★

The National Coal Board have appointed Sir Alexander Gibb and Partners in association with Messrs. Cremer and Brearley to act as their consultants in carrying out the development of underground gasification. They have appointed Humphreys and Glasgow, Ltd., to be the main contractors for the engineering and scientific work. On present plans a pilot scheme should be in operation by the end of 1958. Gas will be delivered to a 5 megawatt generating plant which will be built by the Central Electricity Authority. Newman Spinney near Barlborough on the border of Yorkshire and Derbyshire, has been chosen as the site for the pilot scheme.

★

The Cementation Co. Ltd. recently held a reception on the occasion of the official opening of the new London offices of the company and of its London subsidiaries at 20 Albert Embankment. The Cementation Co. are the sole lessees of this fine building, which is a newly completed 10-storey block with a south wing 180 ft. long facing the River Thames and a shorter east wing at right angles to it. The net office area is 111,000 sq. ft. The upper floors are occupied by the Cementation Co., who have sub-let the rest. On the eighth and seventh floors are the London offices of Cementation (Contracts) Ltd. The sixth floor provides accommodation for Cementation's subsidiaries, Quickset Water Sealers Ltd., Palorit Products Ltd., Cementation (Muffelite) Ltd., Thermacoust Ltd. and the Geophysical Prospecting Co. Ltd.

Metals and Minerals

Selenium, Germanium and Silicon

A task group composed of representative manufacturers of semi-conductor rectifiers was recently appointed by the Business and Defence Services Administration to assist the U.S. government in determining the industry's capacity to produce rectifiers under conditions of full mobilization. One of the major considerations is the availability of selenium, germanium and silicon, which are now reported to be in reasonably good supply.

Selenium, which a few months ago was very scarce, is now much more plentiful in the U.S. In October, 1956—the latest month for which statistics are available—the U.S. production of metallic selenium and selenium compounds was reported to be 112,919 lb. of contained selenium. This output was 29.6 per cent greater than the September production of 87,126 lb., and 59.1 per cent above the monthly average in 1955.

It will be recalled that in June this year the U.S. government announced that it would help to finance exploration for selenium ore by advancing up to 75 per cent of the cost of projects to obtain it. At present roughly 50 per cent of the U.S. supply is imported. If deposits found are exploited by a company which has received an advance, the money must be repaid at the rate of 5 per cent of net sales.

Production in Europe has also been increasing, though at a less spectacular rate, while outlets, except in electronic applications, have been adversely affected by the effects of the credit squeeze. Since November 12, the 10 per cent duty on non-Commonwealth pure metal has ceased to be payable, and this has further contributed to the downward price trend for selenium from non-Canadian sources. Canadian selenium continues to be quoted nominally at 112s. per lb. but quotations in the U.K. for material from other sources are now in the region of 125s. - 150s. which compares with 180s. - 200s. some two months ago.

Early in October U.K. importers of Belgian germanium announced reduced prices for all form of this material. Supplies are still by no means excessive, but will be greatly augmented in the fairly near future as a result of increased production by Ste Métallurgique de Hoboken at Anvers, which is engaged on an expansion programme designed to raise output of germanium dioxide to about 34,000 kilos a year. While this seems to hold out prospects of an easier market position, the rate at which the electronics industries are growing suggests that any increased supply resulting from the stepping up of production at Hoboken will soon be fully absorbed.

Meanwhile, on both sides of the Atlantic, germanium continues to be associated with technological advances, notably in the rectifier field. For example, a new low cost germanium rectifier, incorporating major design innovations and improvements was recently announced by a leading U.S. manufacturer of equipment for the metal finishing industry. Built for volume production, it sells for considerably less than the same manufacturer's standard selenium rectifiers of similar ratings. In August this year the first large germanium power rectifier to be installed on the Continent of Europe was put into service at Péchiney's St. Jean-de-Maurienne factory, Paris. The equipment was made by B.T.H. and consists of two 1,000 kW., 250 v., 4,000 amp. fan-cooled units.

Semi-conductor grade silicon is used by electronic manufacturing companies to make transistors, diodes and rectifiers. Du Pont introduced this material at $430 a pound in 1952. There have since been several substantial reductions, the latest being announced at the beginning of December, 1956, when the price was lowered from $350 to $320 a pound. Further decreases are expected as markets for silicon expand and the volume of production is increased.

The phenomenal rise in sales of germanium and silicon transistors is expected to continue next year, according to Mr. James D. Secrest, executive vice - president of the U.S. Radio-Electronics Television Manufacturers' Association. In ten years transistor output in the U.S. alone may reach 290,000,000 units a year.

ALUMINIUM'S PROSPECTS

Mr. Holbrook R. Davis, a sales official of Alcan, predicts that the U.S. and other Western nations are on the verge of a vast upsurge in the use of aluminium for electrical equipment, construction, piping, cans, and a host of other products. He estimates that by 1960 the free world should be able to produce 4,500,000 tons of aluminium per year, of which one half will be produced in the U.S. and one-fourth in Canada. Aluminium experts see increasing substitution of aluminium for copper, steel and other metals. He considers that in the electrical industry alone 900,000 tons annually will be required by 1960. The oil industry will become a large user of aluminium for piping. Mr. Davis also indicates that by 1980, according to the "best estimate", aluminium cans may represent 5 to 10 per cent of the output of the canning industry, which currently uses 5,000,000 tons of tin plate annually.

★

Kaiser Aluminium and Chemical Corporation has called upon the General Services Administration (GSA) to issue shipping instructions for 1,000 s.tons of aluminium under the "put right" provision of its government supply contract. This clause was included in aluminium supply contracts to protect companies in the event of production from their new facilities exceeding market requirements. This is the first time that an aluminium company has invoked the "put right" clause of a supply contract. Currently the industry does not consider that it has excess production, nor is it regarded as likely that the government will be offered any sizeable quantities of aluminium in the near future.

★

Aluminium Union Ltd. (the International Trading Organization of Aluminium Ltd.) has announced that from January 1, 1957, the surcharge of 30s. per ton on supplies of virgin aluminium will be discontinued. Aluminium Union has acted as an agent of the U.K. aluminium industry for importing and distributing higher cost American metal purchased at a premium in order to maintain the balance of supply and demand, which had been disturbed by the curtailment of Canadian production due to the power shortage in Quebec. By the end of this year the additional cost incurred will have been defrayed.

PLATINUM IN GROWING DEMAND

At the annual general meeting of Consolidated Gold Fields the chairman, Mr. Robert Annan, referred to the increasing use of platinum in industry. When operations in the Rustenburg district began 25 years ago the principal market for the metal was in the jewellery trade. It was realized from the outset that in order to encourage industrial uses, sufficient supplies should be available at a reasonably stable price. This policy has been followed consistently and with outstanding success.

Recently there has been a great demand for platinum catalyst in the process for refining petroleum and successive large additions have been made to the Rustenburg plant, involving a five-fold increase in production in the past ten years, so that the company is now the largest individual producer of platinum in the world.

A further expansion scheme costing around £1,800,000 has since been announced by Rustenburg Mines. The board states that the continued demand for platinum is so high that the rate of output contemplated as a result of the 1955-56 expansion programme will still be inadequate to satisfy the estimated requirements of the market over the next few years. In consequence, it was decided to embark upon a 1956-57 expansion scheme, as a result of which the rate of production will finally be increased by about 80 per cent as compared with 1955.

CANADIAN ASBESTOS

Production and shipment of asbestos from the Canadian mines is running at almost an identical rate with 1955. There has been a slight pick-up in the output of some of the longer fibres, but this has been offset by a drop in the shorter grades due to strikes at the plants of major users. There is reported to be an ample supply of spinning fibre with the exception of crudes.

COPPER · TIN · LEAD · ZINC

COPPER PRICE STABILITY

Undoubtedly, the feature of world copper markets at the present time is their stability. This statement is not made any the less true because Rhodesian Selection Trust has made one of its periodic price adjustments. With effect from December 17, the price for electrolytic copper wirebars c.i.f. to United Kingdom consumers was cut from £280 to £270 a ton. This price cut had only temporary and slight effects on the London Metal Exchange, whereas a movement on most previous occasions has generally been the starting point of a downward slide. In the United States the effect of R.S.T.'s announcement was to cause a modest sag in the price of No. 2 scrap metal, but the general consequence was negligible. With the Christmas holidays and the usual year-end considerations coming into play, there is general reluctance on the part of consumers to undertake fresh commitments, and there is every reason to expect, therefore, that the present stability may hold for a little while yet.

A second reason for the lack of price movement is the general uncertainty as to which way prices may next move. In the United Kingdom and on the Continent there must be some uncertainty about copper supplies so long as the strain on shipping imposed by the blockage of the Suez Canal continues. On the other hand, the possibility that industry will be working short time on a large scale, with a consequent heavily reduced demand for the metal, must be feared to be strong, and any further cuts in fuel or diesel oil would certainly cause fairly widespread dislocation and, on balance, the outlook for copper in the United Kingdom must be considered distinctly bearish.

There are similar conflicts of view in the United States. The reports that the motor industry is about to buy copper more heavily continue to flow but they are not followed by bigger orders to the brass mills. Brass mills are still operating at 65 to 70 per cent capacity. In general, people have come to look hopefully rather than to expect as far as Detroit is concerned. On the other hand output of metal continues to rise and it may well be difficult for the American producers to hold the level of 36 c. with the prevailing level of demand.

★

From Bancroft it is reported that discussions have continued between company and European Union representatives on the strike of 235 European miners which broke out on December 10 after disagreement with the underground manager. Neither side has yet made any statement. Bancroft is due to start producing in the New Year.

It is reported from Santiago that a tentative agreement has been reached at Chuquicamata which would give the workers a wage increase costing 1,500,000,000 pesos a year against the workers' demands of 2,200,000,000 pesos and Anaconda's earlier offer of 1,100,000,000 pesos. The government has still not declared its attitude to a wage increase of this magnitude.

TIN STEADIER IN NEW YORK

The rather sharp fluctuations in prices in Singapore have had some effect on levels in New York but the movement across the Atlantic has been nothing like so marked. In fact, after an initial flurry, the tendency of tin to move downward has been resumed and it now stands at 103.12 c. per lb. for spot Straits metal. The view taken of the Middle Eastern situation is now much more optimistic and demand, while continuing steady has not been exciting for over a month.

MORE U.S. LEAD/ZINC STOCKPILING ?

Reports have appeared in both the *Wall Street Journal* and the *Daily Metal Reporter* to the effect that the United States government will continue acquiring lead and zinc for the stockpile after the goals of 300,000 tons of zinc and 200,000 tons of lead have been met; it is also being said that the government will continue and possibly expand the acquisition of foreign-mined metal through the barter of surplus agricultural produce. Both reports refer to statements made by officials of the O.D.M. but both are at pains to point out that no official decisions have yet been made.

Speculation has been rising on American government policy towards lead and zinc because it is common knowledge that the initial goals have almost been reached. It is now being said by O.D.M. officials, according to the *Wall Street Journal*, that the figures of 300,000 tons of zinc and 200,000 tons of lead were never firm ones and that they can be changed by the simple issue of an O.D.M. directive. This will come as a surprise to most people. When this stockpiling programme was initiated in mid-summer 1954 there was considerable speculation in the Autumn as to whether authority for continuing it into 1955 existed. It was to allay this speculation that the programme was defined in terms of quantities rather than periods. But it now appears that O.D.M. is claiming something of a *carte blanche*.

The lead-zinc lobby in the United States is, of course, among the more powerful; but a much more numerous lobby is that of the income tax payers who are hopefully expecting a tax cut in the next budget, now that the budget is in balance. All that is so far available in London are newspaper reports of interviews with O.D.M. officials in which a number of kites have been flown, and on this basis alone it would be unwise to make judgments.

The way ahead for acquiring foreign-mined lead and zinc under the barter programme is much clearer. The government have, in fact, paid cash for the agricultural stocks and to exchange them for metals, far from involving expenditure, will in fact recoup it. At the same time, it would be wrong to look at this problem wholly from the side of the mining industries. The government is having to tread very warily in disposing of surplus stocks in order to keep within its GATT commitments and to maintain the sympathy of its allies. Furthermore, the President's agricultural programme is designed, by use of the Soil Bank, to prevent the acquisition of further stocks. There is, therefore, an obvious limit to the barter programme set by the actual size of present agricultural stocks.

It is believed that if stockpiling by both methods is continued in 1957 it will not be because the President is convinced that this is an efficient method of assisting the domestic lead/zinc industry but simply because it is the easiest alternative to raising lead/zinc import duties. A decision cannot long be delayed and it may well be thought that to raise duties at the very outset of a new term of office would give the President a bad world Press.

The London Metal Market

(From Our L.M.E. Correspondent)

Markets during the last week have begun to reflect the approach of the holiday season as turnovers have diminished and price fluctuations lessened. The general apathy has been helped by the lack of any concrete developments in the political situation.

In spite of a reduction in the R.S.T. selling price on Monday the standard market in copper has not shown any weakness, as slight additional selling pressure has been matched by "bear" covering prior to the holidays. There has been no pressure from the U.S. as the Japanese have continued to take most of the metal offered to them during the last ten days, but it is understood that the dollar allocation for wirebars is now almost exhausted, whilst the buying of scrap against an allocation of sterling is slowing down. The majority of people expect prices to remain within fairly narrow limits over the next three months, and this is underlined by the lack of willingness to pay more than £20 per ton for a double-option against £30 per ton only two weeks ago. The disappearance of the backwardation is considered to be a temporary technical feature, as there is no sign that there will be any appreciable diminution in the tonnage of metal in official warehouses.

The tin market has not yet settled down from its recent upset, and opinions vary as to the level at which this is likely to take place. The communique from the International Tin Council contained nothing to guide the market, and any possible new buying price range which might be agreed upon would almost certainly be well below to-day's level. The chances seem to be that the market will drift away to somewhere below £750 per ton. On Thursday morning the Eastern price was equivalent to £802½ per ton c.i.f. Europe.

The lead and zinc markets have both recovered from the temporary drop following the U.K. government's announcement of releases of these two metals, and the backwardation in zinc has continued to widen. The upward movements have not been accompanied by any particular features but have been helped by reports that the U.S. Price-Support policy still has a few more months to run and that every effort will be made to find some new means of committing the U.S. government to purchase domestically mined and produced metal. Demand in the U.S. remains of a routine nature, whilst in Europe there are as yet no signs that the oil shortage is affecting the consumption of either metal.

Closing prices and turnovers are given in the table overleaf.

LONDON METAL AND ORE PRICES, DECEMBER 20, 1956

THE WEEK ON THE L.M.E.

	December 13 Buyers	December 13 Sellers	December 20 Buyers	December 20 Sellers
Copper				
Cash	£273	£273½	£271	£271½
Three months	£274½	£275	£270½	£271
Settlement	£273½		£271½	
Week's turnover	4,025 tons		5,175 tons	
Lead				
Current ½ month	£114¼	£114½	£117	£117½
Three months	£113½	£114	£115½	£115½
Week's turnover	4,100 tons		3,125 tons	
Tin				
Cash	£799	£800	£795	£796
Three months	£786	£787½	£780	£782½
Settlement	£800		£796	
Week's turnover	1,205 tons		745 tons	
Zinc				
Current ½ month	£99½	£99¾	£103¼	£103½
Three months	£95¼	£95½	£97¼	£98
Week's turnover	3,500 tons		4,150 tons	

METAL PRICES

Aluminium, 99.5%, £198 10s. per ton

Antimony—
English (99%) delivered, 10 cwt. and over £210 per ton
Crude (70%) £200 per ton
Ore (60%) bases 23s. 6d./24s. 6d. nom. per unit, c.i.f.

Arsenic, £400 per ton

Bismuth (min. 1 ton lots) 16s. lb. nom.

Cadmium 12s. 0d. lb.

Cerium (99% nett), £13 18s. lb. delivered U.K.

Chromium, 6s. 11d. lb.

Cobalt, 19s. lb.

ORES AND OXIDES

Bismuth .. .. 30% 5s./0d. lb. c.i.f.
18/20% 1s. 3d. lb. c.i.f.

Chrome Ore—
Rhodesian Metallurgical (semifriable) 48% .. .. £17 8s. 0d. per ton c.i.f.
,, Hard Lumpy (45%) .. .. £17 8s. 0d. per ton c.i.f.
,, Refractory 40% .. .. £12 15s. 0d. per ton c.i.f.
,, Smalls 42% .. .. £15 9s. 0d. per ton c.i.f.
Baluchistan .. .. £18 15s. 0d. per ton c.i.f.
Columbite, 65% combined oxides, high grade .. .. 190s./205s. per unit
Fluorspar—
Acid Grade, Flotated Material .. .. £22 per ton ex. works
Metallurgical (75/80% CaF_2) .. .. 151s. 6d. ex. works

Lithium Ore—
Petalite min. 3½% Li_2O .. .. £8-£10 per ton f.o.b. Beira
Lepidolite min. 3½% Li_2O .. .. £8-£10 per ton f.o.b. Beira
Amblygonite basis 7% Li_2O .. .. £35-£40 per ton f.o.b. Beira
Magnesite, ground calcined .. .. £28 0s./£30 0s. d/d
Magnesite Raw (ground) .. .. £21 0s./£22 0s. d/d
Molybdenite (85% basis) .. .. 8s. 5d. nom. per lb. (f.o.b.)

Titanium Ore—
Rutile 95/97% TiO_2 .. .. £90 per ton c.i.f. Aust'n
Ilmenite 52/54% TiO_2 .. .. £11 per ton c.i.f. Malayan
Wolfram and Scheelite (65%) .. .. 222s. 6d./227s. 6d. per unit c.i.f

Manganese Ore Indian
Europe (46%-48%) basis 155s. freight plus 15% surcharge .. .. .. 140d -150d. nom. per unit c.i.f.
Manganese Ore (43%-45%) .. .. 115d. nom. per unit c.i.f.
Manganese Ore (38%-40%) .. .. 110d. nom. per unit, (including duty)

Vanadium—
Fused oxide 90-95% V_2O_5 .. .. £12½-£13½ per unit c.i.f.
Zircon Sand (Australian) (63-66% ZrO_2) .. .. £20 per ton c.i.f.

Germanium, 99.99%, Ge.kilo lots 3s. 4d. per gram
Gold, 250s. 5d.
Iridium, £29/31 oz.
Lanthanum (98/99%) 15s. per gram
Manganese Metal (96% - 98%) £259/£265 according to quantity
Magnesium, 2s. 5½d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £24/27 oz. nom.
Osmiridium, nom.

Palladium, £8 0s./£8 10s. oz.
Platinum U.K. and Empire Refined £34/£35 oz.
Imported £37 nom.
Quicksilver, £84/£84 10s. ex-warehouse
Rhodium, £42. oz.
Ruthenium, £15/£17 oz.
Selenium, 112s. nom. per lb
Silver, 79¼d. f.oz. spot and 79¼ f'd.
Tellurium, 15s./16s. lb.

LONDON STOCK EXCHANGE PRICES, DECEMBER 19, 1956

Finance	Price Dec. 19	+ or — on week
African & European	56/10½	+7½d
Anglo American Corpn.	7⅞	+ ⅛
Anglo-French	22/-	+3d
Anglo-Transvaal Consol.	27/6	.....
Central Mining (£1 shrs.)	51/9	—3d
Consolidated G'fields	59/3	+3d
Consol. Mines Selection	31/3	+1/3
East Rand Consols	1/6	.....
General Mining	72/6	+1/3
H. E. Prop.	7/6	+1½d
Johnnies	43/3	+1/3
Rand Mines	68/9	.....
Rand Selection	36/3	+7½d
Union Corporation	37/3	+3d
Vereeniging Estates	5⅛	.....
Wits	35/7½	+1/3
West Wits	35/-	.....
Rand Gold		
Blyvoors	21/6	+1½d
Brakpan	6/3	—4½d
Buffelsfontein	29/1½	+1/3
City Deep	11/3	—3d
Consol. Main Reef	14/6	—6d
Crown	28/1½	—1/10½
Daggas	40/-	+1/-
Dominion Reefs	18/6	+1/6
Doornfontein	22/10½	+1/-
Durban Deep	27/6	—7½d
E. Champs	3/9	—1½d
E. Daggas	9/-	.....
E. Geduld (4s. units)	30/-	.....
E. Rand Props.	48/9	.....
Geduld	4⅞	+¼
Govt. Areas	3/4½	—1½d
Grootvlei	19/6	+4½d
Harmsbeestfontein	45/3	+1/1½
Libanon	7/3	—3d
Luipaards Vlei	13/3	+1/9
Marievale	18/10½	.....
New Kleinfontein	3/6	—1½d
New Pioneer	15/6	+1/3
Randfontein	37/6	+3/9
Robinson Deep	7/6	—3d
Rose Deep	8/6	.....
Simmer & Jack	4/3	.....
S.A. Lands	25/7½	.....
Springs	2/6	—1½d
Stilfontein	27/6	.....
Sub Nigel	21/3	—4½d
Vaal Reefs	33/6	+2/-
Van Dyk	2/3	.....
Venterspost	14/4½	—1½d
Vlakfontein	16/1½	.....
Vogelstruisbult	14/9	+3d
West Driefontein	5½	+½

Rand Gold contd.	Price Dec. 19	+ or — on week
W. Rand Consolidated	33/1½	+2/6
Western Reefs	30/9	.....
O.F.S. Gold		
Freddies	6/9	+3d
Freddies Consolidated	3/9	+1½d
F.S. Geduld	77/6	+1/10½
Geoffries	3/6	.....
Harmony	24/10½	+7½d
Loraine	5/-	+3d
Lydenburg Estates	14/-	—7½d
Merriespruit	4/6	—1½d
Middle Wits	8/7½	+4½d
Ofsits	53/1½	—7½d
President Brand	55/7½	+7½d
President Steyn	33/6	+1/3
St. Helena	29/-	+1/-
Virginia Ord.	9/3	.....
Welkom	16/9	.....
Western Holdings	76/3	+7½d
West African Gold		
Amalgamated Banket	1/3½	—½d
Ariston	3/10½	.....
Ashanti	14/-	—3d
Bibiani	1/10½	.....
Bremang	1/4½	.....
G.C. Main Reef	1/6	.....
Konongo	1/3	.....
Marku	½d	.....
Taquah	10½d	.....
Western Selection	6/10½	+1½d
Australian Gold		
Gold Mines of Kalgoorlie	14/3	.....
Great Boulder Prop.	12/3	.....
Lake View & Star	17/7½	—1½d
Mount Morgan	17/3	.....
North Kalgurli	7/-	.....
Sons of Gwalia	1/10½	.....
Western Mining	11/-	—1½d
Miscellaneous Gold		
Cam & Motor	8/-	.....
Champion Reef	13/-	.....
Falcon Mines	7/9	.....
Globe & Phoenix	23/6	.....
Motapa	10½d	.....
Mysore	3/4½	—1½d
Nundydroog	17/6	+1½d
St. John d'El Rey	51/3	—1/3
Zams	45/-	.....

Diamonds and Platinum	Price Dec. 19	+ or — on week
Anglo American Inv.	8½	.....
Casts	24/10½	+1/6
Cons. Diam. of S.W.A.	10/6	.....
De Beers Defd. Regd.	4½	+ ⅛
De Beers Pfd. Regd.	13½	.....
Pots Platinum	14/9	—1½d
Waterval	24/4½	—1½d
Copper		
Bancroft	45/9	+1/-
Chartered	68/3	+6d
Esperanza	3/7½	+10½d
Messina	8½	—⅛
Nchanga	12½	+ ⅛
Rhod. Anglo-American	5	—
Rhod. Katanga	52/-	+6/3
Rhodesian Selection	43/9	+1/6
Rhokana	38½	+1½
Rio Tinto	4⅞	—
Roan Antelope	25/1½	+1/7½
Selection Trust	4½	—
Tanks	6½	+ ⅛
Tharsis Sulphur Br.	5½	—¼
Tin (Eastern)		
Ayer Hitam	23/3	+1/3
Gopeng	13/4½	+6d
Hongkong	5/4½	.....
Ipoh	25/6	.....
Kamunting	10/-	+4½d
Kepong Dredging	5/3	.....
Kinta Tin Mines	22/3	+9d
Malayan Dredging	14/7½	+6d
Pahang	13/7½	+2/-
Pengkalen	17/9	+3d
Petaling	7/9	+3d
Rambutan	26/6	.....
Siamese Tin	11/7½	.....
Southern Kinta	15/7½	.....
S. Malaya	11/6	—1½d
S. Tronoh	6/10½	+7½d
Sungei Kinta	17/3	+9d
Tekka Taiping	7/4½	.....
Tronoh	12/6	.....
Tin (Nigerian and Miscellaneous)		
Amalgamated Tin	10/3	+1½d
Beralt Tin	48/9	—3d
Bisichi	4/7½	—1½d
British Tin Inv.	22/6	+6d
Ex-Lands Nigeria	2/1½	+1½d
Geevor Tin	19/1½	.....

Tin (Nigerian and Miscellaneous) contd.	Price Dec. 19	+ or — on week
Gold & Base Metal	1/1½	.....
Jantar Nigeria	3/9	—9d
Jos Tin Area	13/9	.....
Kaduna Prospectors	1/6	.....
Kaduna Syndicate	2/-	.....
London Tin	9/7½	—1½d
United Tin	10½d	+1½d
Silver, Lead, Zinc		
Broken Hill South	65/-	.....
Burma Mines	3/7½	.....
Consol. Zinc	69/-	+1/-
Lake George	13/3	—1/1½
Mount Isa	26/6	.....
New Broken Hill	49/-	—3d
North Broken Hill	105/6	—1/-
Rhodesian Broken Hill	12/-	+3d
San Francisco Mines	27/9	—6d
Uruwira	4/3	+1½d
Miscellaneous		
Base Metals and Coal		
Amal. Collieries of S.A.	2¼	.....
Associated Manganese	38/3	—9d
Cape Asbestos	8/10½	—1½d
C.P. Manganese	23/-	—6d
Consol. Murchison	51/10½	—7½d
Natal Navigation	63/9	.....
Turner & Newall	103/6	—1/6
Wankie	17/1½	.....
Witbank Colliery	5⅛	.....
Canadian Mines		
Dome	$25	.....
Hollinger	$50	—½
Hudson Bay Mining	$167	—2
International Nickel	$200	+3½
Mining Corpn. of Canada	£7¾	—¼
Noranda	$109	+¼
Quemont	£7½	—¼
Yukon	4/7½	.....
Oil		
Apex	38/3	—1/9
Attock	35/-	.....
British Petroleum	128/9	—2/9
Burmah	83/-	+1/6
Canadian Eagle	66/-	—3d
Mexican Eagle	23/9	+3d
Shell	143/1½	+10½d
T.P.D.	46/-	+1/6
Ultramar	57/4½	—4½d

Mining Finance

Is Gold Fields a "Growth" Stock?

Foremost amongst the investment attractions of Consolidated Gold Fields of South Africa is the fact that about 90 per cent of its gold holdings is in mines capable of production at the unusually low cost figure of around 150s. per fine ounce. Yet, important though this consideration undoubtedly is in terms of expanding revenue and dividends, the company's recent pattern of development has shown an intention of participating in a far wider sphere of interest than has in the past been associated with Kaffir finance houses. Indeed, for some time now Gold Fields has adopted a most progressive policy towards exploration in countries other than South Africa which include Canada, Australia, the Rhodesian Federation and East Africa. While this should eventually result in a greater geographical distribution of investment risk, it will also entail a growing participation in the exploitation of the numerous metals so urgently needed by a rapidly expanding modern industrial world.

It is, perhaps, upon this potential change of emphasis in its operations that the future of Gold Fields as growth stock depends. But, of course, much hangs upon the success of widespread exploration projects currently in hand. As Mr. Robert Annan has pointed out in his annual statement to shareholders, gold mining still remains the group's most important interest and as at June 30, 1956, represented nearly 60 per cent of the total investment portfolio. He also disclosed that the remaining 40 per cent was divided roughly into equal parts between platinum, base metals, and other interests—which included oil and industrial holdings.

One of the advantages of the proposed merger between Gold Fields and The Central Mining and Investment Corporation would be that substantial liquid resources held by both groups could be pooled together so as to provide the large-scale financial background necessary to meet enormous present-day costs of exploring for, and bringing new mines into production. At the same time, it would be wrong to suppose that Gold Field's future development depended exclusively upon the merger going through. Even if no amalgamation was to take place, there could be little doubt that the company would continue to work—albeit more slowly—towards its planned objectives.

It is, perhaps, this sort of consideration which has kept Gold Fields' £1 shares up to almost their 1956 high point of 61s. 6d. in the face of severe overall decline in the price of most gold mining and finance issues during the year. At their present level of about 59s. 6d. the company's shares return a very attractive 6¼ per cent on the 4s. dividend, which, of course, stands to be raised further as increasing returns are received from its large holdings in the young and expanding Far Western Rand, Orange Free State, and Klerksdorp mines.

KAFFIR DIVIDEND SEASON CLOSES

Further increases in half-yearly payments from the Central Mining, Johannesburg Consolidated, Union Corporation and Anglo-Transvaal group mines have completed what has rightly been regarded as a most successful Kaffir dividend season.

Under conditions of constantly rising production costs in the South African gold mining industry, it was very encouraging that so few cuts in distribution had to be made. In the case of Crown Mines the reduction was by no means unexpected as profits per fine ounce of gold produced during the first nine months of 1956 averaged only 10s. compared with more than double that amount during 1955. Similarly, at Consolidated Main Reef, costs per ounce rose to over 242s. during the first quarter of the financial year 1956-57 from the preceding twelve months' average of about 238s. In consequence profits fell away to under 9s. per ounce from about 12s. 6d. Rand Leases' experience was much worse and profits dropped to just over 3s. per ounce during the September quarter of 1956 compared with nearly 12s. over the previous financial year. Conditions at these three large low-grade mines cannot unfortunately be alleviated by uranium operations profits from which have assisted so many other marginal properties. Fast expanding earnings at the promising Hartebeestfontein mine in the Anglo-Transvaal group made a substantial rise in distribution possible. But few people had expected a payment as large as 1s. 6d.

DECEMBER KAFFIR DIVIDENDS

	1956 Dec.	1956 June	1955 Dec.	1955 June
Central Mining				
Blyvoor	1 0	1 0	1 0	1 1
City Deep	6	—	—	—
Cons. Main Reef	1 6	2 0	2 6	2 6
Crown Mines	2 0	3 0	3 6	3 6
Durban	1 6	1 3	1 3	1 3
E. Rand Prop.	2 6	2 0	2 0	1 9
Modder E.	1 0	1 0	1 3	1 6
T'vaal G.M.E.	10	5	3	6
I.C.I.				
E. Ch'p d'Or	7*	3	4	3
Govt. G.M.A.	3	3	3	4½
Randfontein	2 6	2 6	2 6	2 0
Union Corporation				
E. Geduld	2 3	2 0	2 3	2 0
Geduld Prop.	7 6	6 9	8 0	6 9
Grootvlei	1 4	1 1	1 4	1 1
Marievale	1 3	1 0	1 3	1 0
Anglo-Transvaal				
Hartebeest.	1 6	1 0	—	—
Rand Leases	1½	3	6	6

* Including 4d. bonus.

COMMONWEALTH ALUMINIUM CORPORATION

A new company — Commonwealth Aluminium Corporation—was registered in Queensland, Australia, yesterday.

The company has been formed by Consolidated Zinc Corporation following the proving of hundreds of millions of tons of bauxite of a grade suitable for the manufacture of alumina from its deposit on the west coast of Cape York discovered some months ago by Australian Mining and Smelting Co. Ltd., a subsidiary of Zinc Corporation. The deposit is reputed to be among the largest in the world.

GOLD-URANIUM SHARES FIRM

Markets on both sides of the Atlantic went slow during the past week and investors seemed unwilling to follow any definite trend. Although on Wall Street the usual year-end rally failed to gather strength, *The Dow Jones Industrial Index* moved up to 493.81 by December 19 from 490.47 on December 13. In London trading was slack and investment interest remained at a low ebb. Yet *The Financial Times Industrial Ordinary Index* lost only .9 of a point to 174.3 on the week, and the general undertone reflected an optimistic view of the prospect for an early resumption of oil supplies through the Suez Canal and Middle East pipelines.

The feature of the week for Kaffirs was the announcement that information concerning uranium ore reserves, grade, and production details since July 1, 1955, could in future be disclosed by South African mines. Most gold-uranium issues strengthened on this prospect, but interest centred particularly around Loraine which rumour has long credited with rich uranium ore. Further December dividends from producing mines were well received, but did not constitute an important market factor.

Despite the decreased interim dividend from Nchanga most coppers managed to

make small gains. Indeed, Rho-Kats moved up sharply to around 52s. Tins advanced in places while diamonds and platinums were largely unchanged. West African and Australian Golds were hardly altered and oils established no definite trend. In the miscellaneous section Esperanza jumped to about 3s. 7d. on the better political outlook for Cyprus, though Beralt lost the turn on the dividend maintenance.

Financial News and Results

Nchanga Cuts Interim.—Nchanga Consolidated Copper Mines is to cut its interim dividend from 7s. 6d. to 5s. net (after Rhodesian taxes) per £1 unit for the year ending March 31, 1957. During 1955-56 the interim distribution was followed by a final of 22s. 6d. net.

Broken Hill Offers 1 for 5 at Par.—The Broken Hill Proprietary Company is to offer 5,992,578 shares of £A1 each at par to shareholders in the proportion of one for five held on January 25, 1957.

Apex Earns Less But Pays More.—Apex (Trinidad) Oilfields has raised its total distribution for 1955-56 to 35 per cent tax-free from the previous year's level of 33⅓ per cent tax-free. Net profits declined to £616,845 from £683,804.

New Capital for Sallies.—Recent proposals to shareholders of The South African Land and Exploration Company for raising new capital have been passed. Full information regarding the share offer eventually to be made will be given to members during November, 1958.

Vlakfontein's New Purchases.—Vlakfontein Gold Mining has purchased, or is to purchase, certain assets and mineral rights from West Vlakfontein Gold Mining for a cash payment of £50,000 together with a sum of 12s. 6d. in respect of every square fathom excavated on any reef of the Kimberley Bird, and Main Reef Series in the event of its carrying out mining operations on the original West Vlakfontein lease area.

Lampa to Capitalize £35,000.—By way of signalizing its 50 anniversary, The Lampa Mining Company proposes to capitalize £35,000 from reserve and to issue one fully-paid share of £1 for each £2 of stock presently held. This is in addition to a special Jubilee Cash Bonus of 20 per cent less tax, paid in addition to the ordinary final dividend.

In view of Lampa's large expansion it is felt that issued capital should be brought more into line with capital employed. Reserves would still remain at a substantial figure, while net profits gave ample cover for the special distribution.

With regard to future prospects Mr. J. Shirley Esplen, the chairman, while anticipating lower profit margins, has indicated that operations are continuing on a satisfactory basis. Results of the current financial year—if not so good as those of 1955-56—could, it was hoped, give grounds for satisfaction.

Welgedacht Property Offers.—At the recent meeting of Welgedacht Exploration Company the chairman, Mr. F. E. Hay, said that arrangements were being made to invite offers for the purchase of the company's property. If a suitable bid was received a general meeting would be convened to sanction its acceptance.

CORONATION SYNDICATE

(Incorporated in the Union of South Africa)

CONTINUED STEADY IMPROVEMENT

The Annual General Meeting of Coronation Syndicate Limited was held at Johannesburg on December 14, 1956. **Mr. J. H. Mitchell, O.B.E.,** presided and in moving the adoption of the Report and Accounts for the year ended June 30, 1956, said :—

It is pleasant to be able to report that the steady improvement in Group mine working profits, which has been a feature of the Annual Report for the last three years, has continued, and, as you will note from the Annual Accounts, the total working profits amount to £219,790, in comparison with £191,561 in respect of the previous year. I will refer later to the virtual cessation of operations at Tebekwe and Butterfly Mines.

It has been necessary to provide a considerably larger sum for taxation this year, mainly as a result of the established income tax loss previously held by Arcturus Mines, Ltd., having been exhausted. However, your directors feel that the profit record of the Company justifies a further increase in total distribution of 2½%, and you will therefore be asked to sanction a final dividend of 12½% during the course of the present meeting, making a total distribution for the year of 22½%.

Arcturus Mine

Operations at the Arcturus Mine have yielded excellent results throughout the year. The Working Profit was £61,166 before charging depreciation in comparison with £37,918 during the previous year. Full details of development carried out during the year are given in the Consulting Engineers' report. The development programme which has been vigorously pursued during the last few years has been amply justified as the very satisfactory Ore Reserve position now shows. During the year the Ore Reserves have been increased by 94,713 tons to a total of 401,411 tons at a value of 7.8 dwts. per ton. Of this figure, 83,127 tons averaging 10.6 dwts. are contained in the Slate Reef Section. The installation of the new hoist and headgear to which I referred last year is nearing completion. It is anticipated that the new plant extensions will be finally completed by the end of January, 1957, whereafter the monthly milling rate will be increased as rapidly as possible to 6,000 tons. Tests on grinding the total ore in cyanide solution are being carried out at present and the new plant is equally suitable for this process if adopted. My remarks regarding operations at Arcturus will I am sure show that your directors acted wisely when the decision was taken to enlarge the milling plant and increase hauling facilities. The increase in ore reserves particularly in the Slate Reef Section fully justify the action taken and we can look to increased revenue with confidence.

Muriel Mine

The Muriel Mine continues to play an important part in the success of your Company. The Working Profit for the year before charging depreciation was £111,307 in comparison with £124,229 for the previous year. The drop is mainly due to a reduction of revenue from copper as compared with the previous year. The copper content in the ore adds appreciably to the economy of the mine. During the year, 277.5 tons of copper were produced and in addition 4,290 fine ounces of gold were recovered from the copper concentrates shipped overseas. A systematic diamond drilling programme to test unexplored areas was started during the latter part of the year. On the 6th Level, a hole was drilled to 432 feet. At 353 feet a reef was intersected averaging 29.9 dwts. gold and 2.0 per cent. copper over 9 inches and from 367' to 380' averaged 3.8 dwts. gold and 1.2 per cent copper over 155 inches. In view of these results a crosscut has been driven which is now approaching the reef positions indicated in the borehole and it is interesting to record that this crosscut has already penetrated two ore bodies which did not give a solid core in the borehole. The first body assayed 3.7 dwts. over 48 inches with 0.5% copper and the second ore body 3.7 dwts. over 177 inches with 1.35% copper. These exposures with the higher grade boreholes intersections previously referred to certainly indicate brighter future prospects for the Muriel Mine. Once again the Ore Reserves show a satisfactory increase, from 116,250 tons at 11.5 dwts. over 54 inches at June 30, 1955, to 133,190 tons at the same value over 57 inches at June 30, 1956. The reduction plant, now a very well balanced unit, crushed and treated 40,707 tons during the year in comparison with 38,453 tons for the previous year and the residues were reduced by 0.33 dwt. to 0.92 dwt. per ton milled. A much needed native hospital has been built at the mine and a resident nursing sister employed.

Tebekwe Mine

In my address to you last year I said the life of the Tebekwe Mine was drawing to a close and I must now report that the payable Ore Reserves were depleted during the year. The profit for the year before charging depreciation amounted to £38,509 as compared with £16,332 for the previous year. The increase is due to a general clean up of the plant and milling the surface stockpile, which consists of high grade ore. All material, pumps and hoists have been reclaimed from underground and the mine allowed to flood. During recent months the retreatment of old sand residue has been in progress. The results to date have not given the assurance that this retreatment can profitably continue but your Consulting Engineers are now experimenting with hydraulicing and classification of the sands which may enable profitable operations to continue until the whole dump has been retreated.

Butterfly Mine

The Butterfly Mine, I regret to say, has also had to close down. Development on the eighth level failed to produce payable ore and as a result all mining operations ceased. The sands were let on tribute but the Tributor could not treat them profitably and has relinquished the tribute. A gross working profit of £497, before charging depreciation, was made.

During the year under review further investigation has been carried out with a view to acquiring mining properties within the Union of South Africa. We have not yet been fortunate enough to find a suitable proposition. Investigations are continuing.

The report was adopted.

CONSOLIDATED GOLD FIELDS OF SOUTH AFRICA

LARGER NET PROFIT

MR. ROBERT ANNAN'S SPEECH

The annual general meeting of The Consolidated Gold Fields of South Africa, Ltd., was held yesterday in London.

Mr. Robert Annan, chairman, in the course of his speech, said: Dealing first with the Accounts, the authorised capital of both the parent Company and its operating subsidiary, New Consolidated Gold Fields Ltd., was increased by resolutions passed last year for the creation of an additional 500,000 Ordinary shares of £1 each. Of these the parent Company issued 396,010 shares in exchange for all the issued shares of The Gold Fields Rhodesian Development Company Limited other than those already owned by New Consolidated Gold Fields Ltd.

All the shares so acquired were transferred to New Consolidated Gold Fields Ltd. in exchange for an equivalent number of shares of that Company. The assets of The Gold Fields Rhodesian Development Co. are now incorporated with those of New Consolidated Gold Fields.

The accounts of the operating Company show a working profit for the year of £1,936,000. The principal contribution is made by dividends and interest on our investments which at £1,862,000 again constitute a record and reflect the increasing returns on our holdings in the Far West Rand, the Orange Free State and in the platinum companies. Profit on realisation of investments and sundry revenue was lower at £457,000.

After charging £383,000 for administration and depreciation of fixed assets and £864,000 for overseas and U.K. taxation, the net profit for the year is £1,072,000, an increase of £123,000 over the previous year. £375,000 has been appropriated to Investment and Exploration Reserve and £30,000 to Provision for Pensions. After meeting the Preference Dividends the balance available out of the year's profits is £563,000.

The payment of interim dividends was resumed in July with a distribution of 1s. per share and a final dividend of 3s. per share, making 4s. for the year, has now been declared. These together absorb £563,000, leaving the amount of unappropriated profit virtually unchanged.

The capital and reserves of the operating company and its share of those of its subsidiaries total £16,890,000. This is represented by Fixed Assets £1,089,000. Investments at or under cost £13,133,000, and Net Current Assets £2,668,000. An increase of over £2m. in Investments reflects further additions to our gold and platinum interests and also the inclusion of the holdings acquired from The Gold Fields Rhodesian Development Company during the year.

Gold Mining

Our largest interest is still in gold mining and based on market prices at the date of the Balance Sheet amounts to approximately 58 per cent. of the total value of the group's investments. The balance is divided in roughly equal parts between platinum, base metals, and other interests.

The gold mining industry in the Union of South Africa continues to develop in the direction which I have described in the past. Production from the older mines of the Central and Far East Rand is falling but is being replaced by increasing output from the newer mines in the Far West Rand, Klerksdorp, and Orange Free State fields which, on the whole, give a far higher average yield.

Platinum And Other Interests

Next in order of our interests in South Africa is the production of platinum. Recently there has been a great demand for platinum catalyst in the process for refining petroleum and successive large additions have been made to the Rustenburg plant, involving a five-fold increase in production in the past 10 years, so that the Company is now the largest individual producer of platinum in the world. Further additions to the plant are now being made. We have a large stake in the Rustenburg group of companies and it has proved a very profitable investment.

Next to our African interests come those in the Americas. Gold Fields American Development, wholly owned by New Consolidated, is a mining finance company, with its own portfolio of investments and subsidiary operating companies. Its investments include a holding in the Fresnillo Company, which operates several silver-lead-zinc mines in Mexico and has a good dividend record. The Tri-State Zinc Co., a wholly-owned subsidiary, was originally formed to re-work old tailings piles in the district of that name. Since these were exhausted it has operated a zinc-lead mine at Galena, in north-western Illinois.

Buell Engineering Co. Inc., also wholly owned, specialises in the provision of plant for the collection of industrial dust, whether to avoid the loss of valuable material or to prevent causing a nuisance. The demand for plant of this kind has grown and the company has made rapid progress in recent years, its products having proved to be highly efficient.

Other interests in the Western Hemisphere include our holdings in Apex (Trinidad) Oilfields and in the Ultramar Company. Both these companies continue to do well.

Exploration

It is essential to the life of our business that we should continue to find, and bring to production, new mines to replace those now being worked out. The world demand for metals and minerals is increasing so much that the discovery of new sources of these raw materials is a matter of urgency if the present rate of industrial expansion is to be maintained.

It is our desire not only to expand our business, but also to broaden its basis both geographically and by turning increasing attention to base metals and to the many minerals now required by industry, as well as to those sources of power on which all industry depends.

With these objects in view we have kept up a steady programme of exploration which has recently been intensified. This work takes several different forms. Exploration of undeveloped areas is undertaken either by our own engineers or in participation with others. We have recently appointed additional overseas representatives in Canada, Australia and East Africa with the object of finding prospects to develop or of obtaining participations with other operators.

Proposed Merger

On 27th August last a circular was sent to members of this Company and of The Central Mining and Investment Corporation Ltd. announcing that the two companies had started discussions with a view to a merger of their interests.

We believe that substantial advantage would arise from such an arrangement and that an institution of great financial strength would be created, capable of engaging in development on a substantial scale and of coping with the ever increasing cost of bringing new mines to production.

These discussions are continuing. While much progress has been made, we are not yet in a position to forecast the form which it might take, but I should emphasise that, whatever this may be, the objective of both groups is an amalgamation in the true sense of the term designed to be of benefit to both parties.

The report was adopted.

RECENT FINAL DIVIDENDS AND PRELIMINARY FIGURES

Company	*Year Ended*	*Final Dividend*	*Net Profit after tax*		*Total Dividends*	
			This	*Last*	*This*	*Last*
		%	£(000)	£(000)	%	%
Amal. Colls. of S.A.	31.12.56	12½	911(*c*)	766(*c*)	20(*a*)	17½
Assoc. Mang. of S.A. ..	31.12.56	30	—	—	50	20
Cons. Diamond of S.W.A. ..	31.12.56	100	15,879(c)	13,688(*c*)	150	150
Cons. Murchison	31.12.56	150	—	—	250	320
De Beers Indust.	31.12.56	10(*a*)	811	808	10	10
Jantar Nigeria	30. 9.56	15	17	76	15	60
Vereeniging Brick	31.12.56	15	399	392	22½	22½
Apex Mines	30.12.56	30	—	—	60	55
Jos Tin	31. 7.56	20(*a*)	51	48	20	20
Huelva Copper (ord.)	30. 6.56	20	—	—	20	17½
Huelva Copper (defd.)	30. 6.56	7	—	—	7	7
Cons. Tin Burma	31. 3.56	Nil	8	7	Nil	7½
Tin Fields Nigeria	31. 3.56	Nil	—	—	Nil	12½
Apex Trinidad (*b*)	30. 9.56	30	617	684	35	33½
Lake George	30.12.56	15	245	Dr.4	30	Nil

(*a*) On larger capital (*b*) Tax free dividends (*c*) Before taxation

(Recent interim dividend announcements appear on page 775)

MALAYAN TIN DREDGING
AND
SOUTHERN MALAYAN TIN DREDGING
MR. ERNEST V. PEARCE'S STATEMENTS

The Annual General Meetings of Malayan Tin Dredging, Ltd., and Southern Malayan Tin Dredging Ltd., were held on December 14 in London.

Mr. Ernest V. Pearce, Chairman, presided.

The following are extracts from the statements of the Chairman circulated to Shareholders:—

MALAYAN TIN DREDGING

The working profit for the year amounted to £1,055,466, an increase of over £754,000 on that of the previous year. The increase in profit was mainly due to the exceptionally high values recovered by Dredge No. 3 which operated in the Kampong Gajah area. It is not expected that they will persist throughout the year.

When the new dredge is installed we shall have three large dredges operating in the Kampong Gajah area designed to treat a total 10,800,000 cubic yards and produce 2,250 tons of concentrate a year.

At the end of December, 1958, when we hope that the new dredge will be ready to commence operating, the reserves remaining will amount to 353,000,000 cubic yards giving the area a life of at least 35 years.

International Tin Agreement

The agreement has become operative and an initial Buffer Stock of 15,000 tons metal, or its equivalent in cash calculated at £640 per ton, is being established.

As no producer is likely to contribute metal at £640 per ton while he can sell it on the market at a much higher figure, it is practically certain that the initial Buffer Stock will consist entirely of cash.

Under the regulations the Manager of the Buffer Stock is required to buy and sell tin between a floor price of £640 per ton and a ceiling price of £880 per ton.

At £640 he *must* buy and between £640 and £720 he *may* buy. Between £720 and £800 he is not permitted to operate. Between £800 and £880 he *may* sell and at £880 he *must* sell.

In my opinion the position is quite unrealistic, for on the one hand it seems highly improbable that the price will fall in the near future to £720, while on the other hand, no matter to what extent the price exceeds £800, the Buffer Stock Manager, having no metal at his disposal, will be powerless to apply the brake.

Tin Price

The average sterling equivalent of the Singapore price during the year was £742 10s. per ton.

At the time of writing, November 26, the price is £823.

Production is definitely declining, and, unless new tin fields are discovered, is likely to continue to do so. On the other hand, as the standard of living in the under-developed countries continues to improve, consumption will undoubtedly increase.

While there are bound to be fluctuations in the price, I think we can be satisfied that it will, in the long run, be quite satisfactory.

Situation in Malaya

The first elected Government of the Federation of Malaya has now been in office for some 18 months and during that time there has been ample evidence of its ability and determination to govern with responsibility in the interests of Malaya and of those whose lives and fortunes are committed there. In January this year a Constitutional Mission from Malaya visited London for talks with the Secretary of State for the Colonies and his advisers. These talks, which were conducted in a spirit of friendly co-operation, resulted in a promise of "complete self government for the Federation by August, 1957, if possible."

Fears are from time to time expressed concerning the safety of capital and the treatment which may be accorded to overseas investments in Malayan industries under an independent Malayan Government. The answer, I think, is best expressed in the words of the High Commissioner speaking on November 7, 1955:—

". . . the Federation Government willingly recognises the contribution which overseas capital and enterprise have so made to the opening up of the country; to the provision of employment for many thousands of our people; to the National Income and to Government Revenues—and, indeed, in all these ways to the economic and social well-being of the country as a whole."

". . . It is therefore, and will remain, the policy of the Government to accord to such industry and enterprise fair and considerate treatment to foster an atmosphere in which the overseas investor who is genuinely concerned with the development on sound lines of the country's productive resources can invest and conduct undertakings in this country without fear of discrimination or unfairness; and last but not least, to continue the present policy whereby the overseas investor can, after payment of local taxes and obligations, remit to his country, within the framework of ordinary and reasonable Exchange Control requirements, funds for the payment of dividends and for the repatriation of his capital."

These and similar clear assurances have, on many occasions, been repeated by ministers and others speaking on behalf of the Government. In July it was stated that the Government would guarantee foreign investors that there would be no nationalisation of industry and that a scheme to attract foreign capital would be worked out by the Ministry of Commerce and Industry and the Ministry of Finance.

We rely on these assurances and it is and will continue to be the policy of your board confidently to persevere with the development of the Company's mines and, when suitable opportunities occur, to expand and extend our investment of capital in the Malayan mining industry.

General

The strong position of your Company and of its offspring, Southern Malayan Tin Dredging Ltd., in which we have a large holding, is due in very great measure to the conservative policy which has always been followed in the matter of finance. A sustantial proportion of the profits of both companies has consistently been retained in liquid form either by writing down the fixed assets or by adding to reserves and used to extend our investments in the Malayan mining industry.

SOUTHERN MALAYAN TIN DREDGING

The working profit for the year amounted to £782,028, an increase of £9,530 on that of the previous year.

Current Operations

Of our six dredges five are now in operation. Retreatment of amang in the extensive dumps at the Temoh section with the existing plant in the Tin Shed has shown that these dumps can be profitably retreated. A small new plant for the systematic retreatment of these dumps is now being installed and will shortly be in operation.

The remaining life of the areas now being worked is estimated to be not less than 14 years.

Degong Road Section

The company holds mining titles to the west and east of the Degong/Kampar road in the Chenderiang Valley, and agreement having been reached with the Drainage and Irrigation Department on a scheme for deviating the Chenderiang River and working the land to the west of the road, arrangements are now in hand for the equipment and mining of this area.

The property comprises 1,012 acres, of which the Company holds mining titles over 495 acres. The issue of mining leases over a further 383 acres has recently been approved, and application has been made for a mining lease over 134 acres of the Chenderiang River Reserve. Since the approved scheme for the working of the property involves deviation of the river and the mining of this Reserve, it can be assumed that a mining lease over the Reserve will be issued.

The estimated volume of the dredgeable ground in this property is approximately 100,000,000 cubic yards with an estimated average recoverable value of .426 lb. per cubic yard. The total of the recoverable concentrates is estimated to be approximately 19,000 tons and, with the dredge it is planned to install, the estimated working life with one dredge in operation is 32 years with an average annual recovery of 593 tons of concentrates.

It is hoped to have a dredge working on this property early in 1959 when, with the five dredges it is expected to have working on the Tanjong Tualang and Teja sections, the Company should have six dredges in operation.

Research

The Tin Research Institute continues its most valuable work in the interest of the Tin Industry.

Intensive research is being carried on in many directions such as the use of organic tin compounds as a fungicide, the continuous casting of bronze, the development of tin bearing alloys for bearings, the prevention of corrosion in tin plate, etc.

That much success has resulted from the Institute's work, is evidenced by the fact that users of tin all over the world are constantly seeking information regarding results of the research carried out.

SUNGEI BESI MINES
AND
AYER HITAM TIN DREDGING
MR. G. W. SIMMS'S STATEMENTS

The annual general meetings of Sungei Besi Mines, Ltd., and Ayer Hitam Tin Dredging, Ltd., were held on December 14, in London.

Mr. G. W. Simms, the Chairman, presided.

The following are extracts from the statements of the Chairman circulated to shareholders:—

SUNGEI BESI MINES LTD.

The working profit for the year to March 31, 1956, is £192,179. After providing £96,017 for Taxation, there remains a balance of £96,162, which together with the balance unappropriated at March 31, 1955, £80,833, makes a total credit of £176,995. A further reserve of £50,000 has been made in respect of road and railway deviations. Dividends totalling 1s. 7.2d. per share (less Income Tax) have been paid in respect of the year, leaving a balance of £86,458 to be carried forward.

Direct taxation on the Company for the year amounted to £194,003, comprising Tin Duty £97,986 and United Kingdom Income tax and Profits Tax £96,017. The total represents no less than two-thirds of the Working Profit before deducting the Tin Duty. If the Malayan Government and the United Kingdom Government seriously wish to encourage investment in the Tin Mining industry and its further development, a most effective way of doing so would be to adopt a more enlightened policy as regards mine taxation, and thus to alleviate the onerous burden which mining ventures now have to bear. When income tax was introduced in Malaya, one of the objects advanced was to even out and spread more widely the incidence of taxation which bore with undue severity upon the Tin and Rubber industries. The Tin Mining industry was given reason to hope that when income tax became established, there would be a reduction in the Export Duty on Tin, but this hope has not yet been realised.

Sungei Besi Section

As a result of a general reorganisation of our mining operations and treatment plant involving increasing the capacity of the latter, we expect materially to increase the throughput and to reduce operating costs.

It has become necessary to deviate the road and railway over a distance of approximately 62 chains to enable us to win payable karang along the western side of our present Mining Leases together with rich karang lying at relatively great depth below the present floor of our North Opencast.

Government has approved the road and rail deviation and has agreed to issue a Mining Lease to us over an area of approximately 15.56 acres covering the present Road and Railway Reserve.

Preparatory work on the road and rail deviation is proceeding satisfactorily. These deviations are estimated to cost the sum of £100,000.

Pelepah Section

Security conditions in the district remain difficult and call for the utmost vigilance on the part of our European Staff. The General Manager refers to an incident in December, but on the night of September 8, 1956, a much more serious attack was carried out by 20-30 well armed terrorists wearing uniform in which one Special Constable was killed and another was badly wounded.

Political Situation

Constitutional changes are still in progress in the Federation of Malaya, and by August, 1957, H.M. Government has agreed it possible to grant to the Federation independence within the Commonwealth. I would refer to assurances to overseas investors given by the High Commissioner at a recent meeting of the Federal Legislative Council. There is no justification for changing the long-established policy of continuing and expanding our operations in Malaya by improving the efficiency of existing installations and by seeking and equipping new areas.

AYER HITAM TIN DREDGING LIMITED

The working profit for the year to June 30, 1956, is £156,667. After providing £86,917 for Taxation there remains a balance of £69,770, which, together with the balance unappropriated at June 30, 1955, £112,653, makes a total credit of £182,423. Dividends totalling 2s. per share (less Income Tax) have been paid in respect of the year, and the Directors recommend that the remaining balance of £109,356 be carried forward.

The dismantling of No. 2 dredge at Harrietville has now been completed, and it is expected that the last shipment comprised largely of pontoon material, will be despatched from Melbourne about the end of December. As most of the material is now on the property and as everything is ready at the building site to start on the dredge erection immediately the pontoon material comes to hand the work should go ahead smoothly and rapidly.

International Tin Control Agreement

This Agreement became operative on July 1, 1956, and Malayan producers are now being called upon to meet their contribution to the Buffer Stock. Having regard to the future outlook for world production and consumption the provision of a fund to purchase non-existent surplus tin cannot be in the best interest of producers, or, for that matter, of consumers either. The contribution which Malayan producers are now compelled to make could be far better used in endeavouring to prove and develop new sources of supply in Malaya, and in trying thus to arrest the fall in production which must take place there within the next few years unless sufficient new areas suitable for dredging can be proved and equipped.

As regards the three biggest producing countries, the evidence points to decreasing production over the next few years. In the case of Bolivia and Malaya the probability of a substantial decline is evident. There is no evidence which would suggest the possibility of any substantiial increase from other producing countries to off-set this position.

The present rates of world mine production (excluding China and the U.S.S.R.) and world consumption as shown by the International Tin Study Group Statistical Bulletin are as follows:—

	First 8 months of 1956 Tons	*Equivalent Annual Rate Tons*
World Mine Production	108,100	162,200
World Consumption	101,300	152,000

Owing to the Steel strike in the U.S.A. consumption there in July fell to 2,455 tons from an average of over 5,000 tons per month for the first six months of 1956, the world total for that six months being 80,500 tons. On that basis, the established rate of World Consumption for 1956 was 161,000 tons, against a World Mine Production rate of 162,200 tons per annum.

In the U.S.A. the rate of Tin Plate production for the first half of 1956 shows an increase of approximately 20 per cent. over the 1955 production, and a similar rate of increase may be expected in the U.K. next year as new mills come into production.

As World Mine Production and Consumption are now in balance and all indications point to a falling production and the likelihood of increasing consumption what is needed is a Scheme to encourage expansion of Production instead of an International Agreement which aims at restricting it.

It is little short of farcical now to collect from producers a sum in cash which is the equivalent of 15,000 tons of tin metal at £640 per ton to create a Buffer Stock when there is no likelihood of being able to acquire surplus tin.

At present prices the Buffer Stock should be in a position to sell tin, but it has none to sell. Nor is it likely to have any in the foreseeable future. By the end of the first quarter producers' contributions will have amounted to a considerable sum and the possibility and need of the Buffer Stock being able to use the money to buy tin is so remote that it would be only reasonable that the countries party to the International Tin Agreement should agree to cease levying contributions from producers at the end of the first quarter.

It is time that this International Tin Agreement was scrapped. It is completely useless and yet can act as a brake on the development of new production which is so urgently necessary. The problem facing the tin industry is one of under-production, not over-production. It should be quite obvious that conditions in the main producing countries are now such that a fall in tin price to anywhere near the floor price of £640 per ton under the Buffer Stock price range would have an immediate repercussion on production and provide corrective action much more rapidly, efficiently and fairly than is possible under the Tin Control Scheme and with resulting benefit both to Producer and Consumer.

Tin Research

The Tin Research Institute is doing excellent work to discover new uses for tin and improve existing uses. I believe that along that path lies the way to the sound future development and protection of the industry and that money spent on the research work of the Institute is money wisely spent.

BRITISH OVERSEAS MINING ASSOCIATION

URGENT NEED FOR TAX RELIEF

HOPES FOR EARLY INTRODUCTION OF "OVERSEAS TRADE CORPORATIONS"

The eleventh Ordinary General Meeting of British Overseas Mining Association was held on December 19 at 49, Moorgate, London, E.C.

Mr. S. E. Taylor, D.S.C., the president, who was in the chair, in the course of his speech said:—My predecessor as President of the Association, when addressing last year's general meeting, referred to the recommendations made by the Royal Commission on the Taxation of Profits and Income that a new category of companies should be established under the style of "overseas trade corporations," which would be liable to U.K. taxation in respect of distributed profits only.

The Chancellor of the Exchequer informed the House of Commons on June 19 last in the course of a debate on the Committee stage of the Finance Bill that he had a great deal of sympathy with this recommendation and promised to give careful consideration to the possibility of introducing legislation to give effect to it in the 1957 Finance Bill.

I sincerely hope that my successor may be in the happy position next year of reporting to you that legislative effect has been given to this recommendation and that the efforts of this Association over a number of years to secure adequate recognition of the tax problems of the overseas mining industry will have been thus rewarded.

Variety of Companies in the Industry

The mining interests represented by this Association fall broadly into three classes. The first class consists of companies which operate in overseas mining fields and are managed and controlled in the United Kingdom. Some very important operating companies have already ceased to be managed and controlled in the United Kingdom but a number of valuable overseas mineral deposits still remain under the direct control of U.K. companies. It must be to the advantage of this country's economy to create tax conditions under which that control can be retained.

The trek of British mining companies overseas has been due, of course, to other factors besides taxation, but a liberal and progressive policy in the U.K. tax field would at least provide good argument for countering the strong non-tax factors pulling such companies out of the U.K. tax jurisdiction.

The second class consists of holding and co-ordinating companies which hold share control of, or have substantial investments in, mining companies managed and controlled overseas. The growth of the U.K. holding company with widespread interests in mining companies overseas is in part a necessary development in giving local participation in overseas mining ventures and in part an attempt to minimize the U.K. tax burden. U.K. taxation on the dividends receivable by the U.K. holding companies is an obstacle to the reinvestment of its funds in new exploration and development projects in overseas territories.

The third class consists of mining finance houses which explore, develop and finance overseas mining fields, setting up operating companies overseas to exploit and operate successful mines. These operating companies are closely associated with the sponsoring U.K. company, but are not necessarily subsidiary companies, though the operating and managerial links may be very strong.

Both the holding companies and the finance house are concerned with all aspects of mining, from the location of new deposits, the search for which under modern conditions demands continual expenditure on a scale which only companies with large capital resources can support, to the ultimate exploitation of such deposits. It is the usual practice to form new companies to work the deposits when the stage of exploitation is reached but the shareholdings, both of the holding companies and the finance houses, in such operating companies are of a nature far removed from the "portfolio investments" which, in the view of the Royal Commission, ought to be excluded from the scope of "overseas trade corporations."

The first class of company, namely the U.K. operating company, falls clearly within the narrowest definition of "overseas trade corporations." In the opinion of this Association, the second and third classes of companies should also be recognized as falling within that category and it is of the greatest importance to the future of the British overseas mining industry that the legislation introducing "overseas trade corporations" should be so drafted.

"Overseas Trade Corporations" in Relation to "Pioneer Industries Reliefs"

In his speech on the Committee stage of the Finance Bill, 1956, the Chancellor promised to introduce legislation with retrospective effect in the following year's Finance Bill to deal with the frustration by the U.K. tax system of "pioneer industries reliefs" granted overseas. He expressed the view that the bigger question, namely "overseas trade corporations", would settle the smaller ones, namely the frustration of "pioneer industries reliefs," but the Association ventures to suggest that this assumption is not accurate.

It is true, of course, that the introduction of "overseas trade corporations" would confer tax relief over a wider range than the granting of reciprocal relief in respect of pioneer industries, however widely such industries might be defined in the promised legislation. The Association suggests, however, that U.K. companies, which might not fall within the definition of "overseas trade corporations," would be eligible for reciprocal "pioneer industries reliefs" and that it would seem unfair to deprive them of the promised benefit under the latter heading merely because they cannot qualify for benefit under the former heading.

In the Association's view, the correct procedure would be to grant reciprocal "pioneer industries reliefs" to all companies eligible for them and, when the company falls within the definition of "overseas trade corporations," to take the "pioneer industries reliefs" into account in calculating the rate of U.K. tax at which the company would account to the Revenue in respect of its dividends.

The Association has already outlined its views to the government on the subject of "pioneer industries reliefs" and "overseas trade corporations." Whatever may be the financial difficulties next spring, the government is committed to the introduction of new legislation to end the frustration of overseas tax concessions, and I venture to hope that it will also recognize the urgency of introducing the concept of "overseas trade corporations" in order to retain and stimulate the important contribution which the British overseas mining industry makes to the economy of the United Kingdom and the Commonwealth.

The Industry's Need for More Technologists

It is clear that, if the overseas mining industry is to succeed in satisfying the rapidly expanding demand for its products, it will need the services of many more geologists, mining engineers and other technologists than are now available, and that the number of young men at present offering themselves for the necessary academic training at Universities and Schools of Mines is not sufficient to meet the industry's future requirements.

The Association has prepared a booklet illustrating the nature and scope of the industry and the interesting and rewarding careers which it offers to young men of the right type. This booklet has been issued to a large number of schools and, by this means and by other forms of publicity, the Association hopes to stimulate the influx of young men trained in metalliferous mining and extraction metallurgy into the overseas mining industry.

The report for the year ended September 30, 1956, was unanimously adopted.

Mr. A. M. Baer was elected president and Mr. Clifford Waite vice-president for the ensuing year and the proceedings terminated with a vote of thanks to the retiring president.

The following vacancies exist with Kilembe Mines Ltd., Mining Department:

SHIFT BOSSES. Applicants either graduate or non-graduate should have at least three years' operating experience in cut and fill and/or open sub-level stoping.

STUDY ENGINEER. Graduate Mining Engineer preferred with 3 to 5 years' experience, some of which should have been as Shift Boss. This position will carry Mine Captain status and provides adequate opportunity for the successful applicant to exercise his initiative.

UNDERGROUND ENGINEER. This position demands a man capable of installing and maintaining underground mechanical equipment such as diesel and battery locomotives, scraper hoists, etc. In addition a small workshop and rock drill repair shop falls within the scope of the underground mechanical services section. The successful applicant will be required to organize and supervize semi-skilled and unskilled Asian and African fitters, establish a preventive maintenance programme and keep adequate records.

Apply, giving full particulars of works history, personal particulars, qualifications, etc., to General Manager, Kilembe Mines Ltd., P.O., Kilembe, Uganda, East Africa.

MOUNT ISA MINES

MR. G. R. FISHER'S REVIEW

The Annual General Meeting of Mount Isa Mines, Limited, was held on December 4 at Brisbane.

Mr. G. R. Fisher, the chairman, in the course of his speech, said:—

The net profit for the year ended June 30, 1956, was £4,301,931, compared with £3,307,250 for the previous year. The total dividend disbursement for the year amounted to £1,439,328 out of net profit.

Stockholders were advised last year that the company's policy is to finance capital expenditure from profits and reserves. This policy has been continued but, if adequate rail transport is provided and the expansion programme expedited, it is possible the policy of financing expansion from profits and reserves may not meet the situation.

Ore Reserves

Development of the mine was continued at a record rate.

The total advance of development headings and diamond drilling of 124,552 feet considerably added to our knowledge of the ore potential at Mount Isa, and also increased ore reserves and placed the mine in the position to increase production when conditions render this possible.

In published copper ore reserves of 7,800,000 tons assaying 3.75 per cent. Cu, 3,326,000 tons of 3.4 per cent. Cu ore have been included from the new 500 copper lode. This, together with ore withdrawn from reserves to allow for future irreclaimable pillar ore, is represented by a block extending 1,000ft. along the strike of the ore-body with an average width of 105ft. and a proven vertical depth of 500ft. This block of ore has been well delineated by underground workings and can be classified as ore reserves.

Regarding the silver-lead-zinc ore reserves, large tonnages of ore additional to the published figures of 14,200,000 tons of 6.0oz. Ag, 8.1 per cent. Pb, 6.1 per cent. Zn are strongly indicated by core drilling, but have not been included because additional information from underground workings is required before firm estimates of tonnage and grade can be published.

Expansion Plans

You will note from my remarks on ore reserves that the orebodies at Mount Isa justify a considerably greater rate of production than is being achieved at present. The company has advised the Queensland and Federal Governments that, if rail transport is available, production will be increased from the present rate of 4,000 tons of combined lead-silver-zinc and copper ores to 13,000 tons a day. Subject to favourable marketing and other considerations and provided adequate rail transport is available, it also is apparent that expansion beyond this rate may be justified in subsequent years.

Copper Refining

Copper refining capacity in Australia is insufficient to refine all the Australian blister copper production. With the proposed expansion at Mount Isa, and with the possible necessity to export refined copper because Australian production may exceed consumption, then it is most desirable that the refinery be situated at Townsville, our shipping port. Arrangements have therefore been made for the construction of an electrolytic copper refinery at Townsville, with an initial capacity of 30,000 tons of refined copper per year, and capable of expansion to 60,000 tons of refined copper per year. Construction of this refinery has already commenced.

Rail Transport

Before any expansion of production beyond the present rate can be achieved, it is essential that the railway facilities from Mount Isa to Townsville be completely rehabilitated. In February last the company advised the Queensland Railways Commissioner of transport requirements to meet expanded ore production from the present rate of 4,000 tons to 13,000 tons per day. A joint committee of Commonwealth and Queensland officials has been examining the situation and it is hoped that, as a result of this examination, a decision will be made in favour of reconstructing the railway so that all Mount Isa's requirements can be met.

It is regretted that such a long delay has occurred in reaching a decision, as this delay has meant that the time of increased production has been postponed.

The report and accounts for the year ended June 30, 1956, were adopted and a final dividend of 9d. per stock unit was declared, as recommended in the directors' report to be paid on December 31, 1956, to stockholders as at November 23, 1956.

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PAHANG CONSOLIDATED

FURTHER SATISFACTORY RESULTS

The fiftieth annual general meeting of The Pahang Consolidated Co., Ltd., was held yesterday in London, **Mr. G. H. Fairmaid, M.I.M.M.,** chairman and managing director, presiding.

The following are extracts from his circulated Address for the year ended July 31, 1956:—

Your Board has pleasure in announcing another satisfactory year's results.

Some 201,700 tons of ore was treated with an output of 2,498 tons of mill tin oxide.

In November, 1955, a fire occurred in the Bells II Lode on the 700-ft. Level which did not die out until mid-February, 1956. Since reopening, recovery work has made good progress and some ore is already being obtained from this area. As a result of the fire, there was an 18 per cent drop in output for a few months.

Mill

Since 1954, the mill flowsheet has been radically altered and there has been a marked increase in recoveries, the average grade of ore treated last year being 1.25 per cent. compared with 1.42 per cent. in 1954/5. A new flotation plant is to be installed which will further add to the efficiency of the Mill. The re-treatment of slime is being investigated and it is expected that within the next year we will have information to justify the erection of a new slime treatment plant. As a result of the improvements in treatment, a sulphide tailing from the flotation cells is now being sold for its copper content.

Interim dividends of 3½ per cent. on the Preference and 10 per cent. on the Ordinary stock have been paid and the Directors recommend final dividends of 11½ per cent. on the Preference and 40 per cent. on the Ordinary stock.

Chairman's Additional Remarks

Addressing the meeting, the Chairman said:—

In our balance sheet, an amount of £402,000 is set aside as provision for taxation and negotiations on a final settlement of outstanding tax claims are now in an advanced stage. It is hoped that the tax position will be cleared up shortly, if, as anticipated, the result is to the benefit of Stockholders. Your Directors will be making recommendations at an early date.

With regard to Development, in the lower levels of Myah Mine, development at the No. 13 and 14 levels has not been entirely satisfactory but in spite of this the prospects are that further sinking of the Shaft will be necessary, involving the purchase of a new winder, a new headframe and additional power plant. Adding to this the cost of sinking the shaft a further 500 ft. an outlay of some £250,000 may be required so that it is evident that although our reserves are substantial, they will largely be required for further expansion.

During the last few weeks, a new and promising lode has been exposed on the 700 ft. level some 3,000 ft. North of the Vent Shaft. To date the lode has been exposed over a length of 190 ft. of which 154 ft. has been payable with an assay value of 3.3% over a width of 59 inches. The true width of the lode has yet to be exposed.

The report was adopted.

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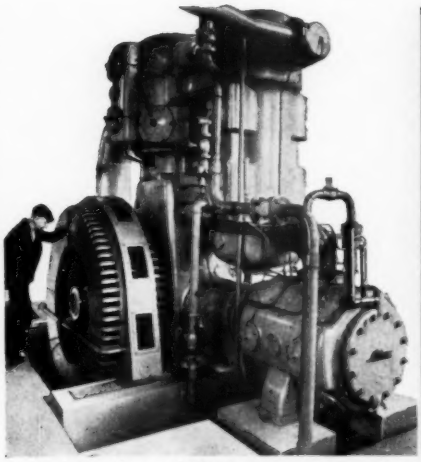
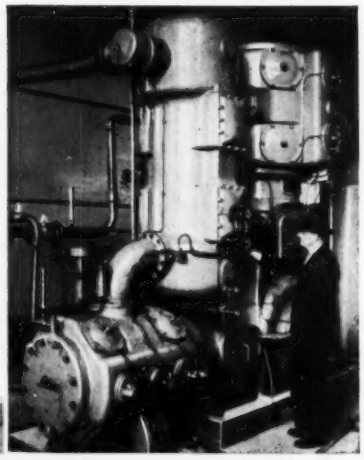
Choose a rugged Atlas Copco AR Compressor and you can rely on it to deliver more air, h.p. for h.p., than any other compressor of its class. The reason is that these machines have been developed with the aim of low operational costs—both in fuel and upkeep. Take the AR 3 mentioned below. Its power consumption at 100 lbs. per sq. in. is 105 h.p. With this power consumption the supply of free air is 570 cu. ft. per min. Compare performances!





An Atlas Copco AR9 Compressor installed at N.C.B. Mountain Colliery, S. Wales

The above photographs are published with the permission of the National Coal Board

FUEL SAVING PAYS FOR OUTLAY

To get the same amount of air from other compressors would, in most instances, require an additional 15 h.p., but 15 h.p. never used mean an *annual saving on fuel bills of £270*. That amount of money represents approximately *one-fifth* of the initial cost of the AR 3. In five years, that's your money back!

FLEXIBLE AIR SUPPLY

Three-step valve unloading control on smaller models or five-step clearance pocket control on larger sizes permits flexible adaptation to variations in air demand. Also means smooth flow of current to motor.

LOW DISCHARGE TEMPERATURES

Amply-dimensioned water pockets, the two-stage design and streamlined air passages give discharge temperatures below 270° F at 100 lbs. per sq. in.—as compared with 475° F from most single-stage machines. Lower temperatures mean longer valve life and elimination of the risk of air receiver and pipe-line explosions.

EXTRA-SOLID CONSTRUCTION

High-class Swedish materials and steel throughout; amply-dimensioned parts reduce stresses to a minimum; crankshafts carried on SKF roller bearings; cross-head design with ground or white-metal lined bearings avoids piston side pressure, eliminates cylinder wear.

EASE OF INSTALLATION

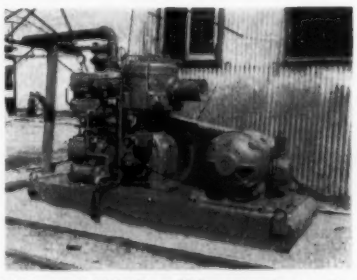
Right-angled, double-acting cylinders combined with counterweighted crankshaft provide a very low weight/capacity ratio and extremely good balancing—thus reducing foundation requirements. So good indeed, that most models can be mounted on a skid underframe and used as semi-portable units without any foundation or bolting-down.

The Atlas Copco Group puts compressed air to work for the world. It is the largest group of companies specialising solely in the development and manufacture of compressed air equipment. It embraces Atlas Copco companies or agents manufacturing or selling and servicing Atlas Copco equipment in ninety countries throughout the world.

For further information about the equipment featured please contact your nearest Atlas Copco Company or Agent. There are Atlas Copco companies in Wembley (England); Paris; Rotterdam; Milan; Brussels; Copenhagen; Oslo; Stockholm; Essen; Madrid; Istanbul; Nicosia (Cyprus); Casablanca; Benoni (Transvaal, S.A.); Ndola (N. Rhodesia) and Bulawayo (S. Rhodesia); Montreal; Paterson N.J. and San Carlos Cal. (U.S.A.); Torreon (Mexico); Auburn (N.S.W. Australia); Wellington; Rio de Janeiro; Santiago de Chile; Lima. If you have difficulty in contacting your local Atlas Copco organisation please write to Atlas Copco AB, Stockholm 1.

PERFORMANCE FIGURES OF ATLAS COPCO AR COMPRESSORS

Type	Maximum pressure lb./sq. in.	Speed at 50 cycles r.p.m.	Low-pressure piston displacement cu. ft./min.	Free air delivery at 100 lbs./sq. in. cu. ft./min.	Power required at 100 lbs./sq. in. h.p.	Cooling water required at 60° F approx. gal./hr.	Weight lbs.
AR 1	120	600	400	330	62	310	3000
AR 3	120	500	715	570	105	500	5400
AR 4	120	429	910	760	138	680	6600
AR 5	120	375	1235	1000	186	880	9000
AR 7	120	333	2120	1740	318	1520	14500
AR 9	120	300	4020	3210	586	2920	26400



A skid-mounted Atlas Copco AR Compressor in operation at Pima Mining Co., Arizona, U.S.A.

Atlas Copco

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NORTH KALGURLI (1912) LIMITED

EXTENSIONS TO PLANT

The annual general meeting of North Kalgurli (1912) Limited was held on December 14 in London, **Mr. H. A. Kemlo,** chairman, presiding.

The following are extracts from his circulated statement for the period ended March 20, 1956 :—

Last year our accounts covered a period of sixty-four weeks. This year they cover the normal period of fifty-two weeks, which is just over three-quarters of the previous period, and this difference needs to be borne in mind when making comparisons between the two sets of figures.

During the year we treated 360,751 tons of ore, containing 87,162 fine ounces of gold, to produce a profit before taxation, of £110,243. Taxation takes £58,143 and, after allowing for the interim dividend of 3d. a share paid in March, and the final dividend now recommended of 3d. a share on the increased capital, our carry-forward is increased from £42,292 to £54,335.

Balance Sheet Changes

There are no changes in the Balance Sheet of any great significance. The increase in Buildings, Plant and Machinery mainly represents initial expenditure on the Croesus Plant extension, and that expenditure likewise accounts for the increase in the bank overdraft from £73,873 to £105,046.

It is since the end of the year covered by the accounts that major changes have taken place. In April, 1956, the issued capital was increased by the issue of 1,100,000 shares of 2s. each, and it now stands at £330,000 in 3,300,000 shares of 2s. each, fully paid. The new shares were offered to shareholders in March at the price of 4s. a share, and the issue was over-subscribed. Out of the proceeds of the issue we have paid off the bank overdraft and financed the remainder of the Croesus Plant extension. The cost of the extension to date has been approximately £A86,000, but there are some deferred items still to be dealt with, which will bring the total cost to a total somewhat smaller than the estimate of £A200,000 which was given last year.

The Milling Plant

The extensions to the Milling Plant were brought into service in July, 1956, but additions to the Roasting Section are not yet complete. A Roaster of new type designed by our Mill Superintendent has been installed but, being a prototype unit, it has been found necessary to carry out certain modifications and alterations chiefly of a mechanical nature, and the unit has not yet reached the performance desired. In consequence there is a shortfall in roasting capacity at present and excess concentrates are being stockpiled until we have the roasting capacity available to deal with them. This shortfall in roasting capacity will necessarily affect our profits during the current year. We are installing an additional roasting unit in order to ensure that we have adequate roasting capacity, and to deal with the concentrates which have been accumulating; these alterations are in progress, and should be completed by April of next year.

We have ceased to send ore to the K.O.T. Plant, although we are temporarily continuing to make use of the gold-room facilities. At present Gold Mines of Kalgoorlie Limited are making use of the crushing and roasting sections of the plant, by arrangement with us, for the treatment of some of their ore. The future of the plant, that is to say whether Gold Mines of Kalgoorlie Limited would like to take it over or whether it should be broken up, is under discussion.

Mining Operations

On the mining side, the principal matters of interest are that our Northern group of leases, served by the Croesus shaft, are now in production again for the first time since 1941, and work has begun on sinking the New Main Shaft a further 500 feet, to bottom at 2,130 feet. At the end of last year our Underground Manager, Mr. F. A. Davis, and our Consulting Geologist, Mr. K. J. Finucane, undertook a critical re-examination of the ore resources in the Southern Group of Leases and you will see from their Report that this has resulted in an over-all decrease in grade assessment of 0.16 dwt. Development plans for the future include:

(*a*) Continuation of current programme of exploring ore indications above present deepest horizon, opening up ore indicated by diamond drilling, and extensions of partly exposed ore bodies.

(*b*) Investigation of ore potential of Oroya North Block area which has been entered by cross-cuts from the Kalgurli Section of Nos. 4, 6 and 8 levels.

(*c*) Deepening both the Kalgurli and Main Shafts and developing the extensions in depth of present known ore bodies.

(*d*) Further developments in the Croesus Section Leases.

On the whole we have come through a period of reorganisation remarkably well, and as soon as the plant extension is fully operative we should see a good return on the capital expenditure involved. We have succeeded in keeping down operating costs against continued increases in wages and cost of materials, but there is no doubt at all that it is a hard struggle.

Problem of Gold-Mining Pay

This problem of making gold-mining pay its way on a fixed and unchanging price for the product is common to all Westralian producers, and indeed to gold producers throughout the world, and in the end the solution can only lie in an increase in the price of gold.

The increased cost of production qualifies the Company, we believe, for some subsidy in terms of the Commonwealth Gold Mining Assistance Act. The amount of subsidy payable, however, is dependent in some degree upon Treasury interpretation of "Capital used in production" which has not been clearly defined and it is not possible at present to indicate to what extent, if at all, we shall benefit.

A year ago I announced the Board's intention to investigate the possibility of transferring the domicile of the Company to Australia, and in June, 1956, a circular was sent to you reporting that the Company's application to the United Kingdom Treasury for permission to transfer had been refused, no reasons being given. As your Board felt that the matter should not be allowed to rest there, we have submitted a fresh application. Before doing so we requested the Australian Government, in view of its general policy of assisting the gold mining industry, to lend their support. This they agreed to do, and we have lately been informed that the Australian Government's views have been communicated to the United Kingdom authorities. Because the matter is in a sense *sub judice*, I will say no more on the subject at the moment, but shareholders will be kept informed of developments.

The Report and Accounts were adopted.

RECENT INTERIM DIVIDEND ANNOUNCEMENTS

Company	*Year Ending*	*Dividends Latest*	*Dividends Previous*	*Date Payable*	*Total Last year*
		%	%		%
Kepong Dredging	30. 6.57	5	5	Jan. 7	15
Rooiberg Mins.	30. 6.57	2½	Nil	Feb. 8	Nil
T'vaal Navig. Colls.	30. 6.57	6	5	—	10
Hongkong Tin	30. 9.56	5	Nil	Jan. 1	Nil
Malayan Tin Dredge (*a*)	30. 6.57	7½	6⅔	Jan. 29	40
S. Malayan Tin Dredg. (*a*)	30. 6.57	6⅔	6⅔	Jan. 25	33⅓
William Jacks	31.12.57	7½	7½	Jan. 31	20
Lobitos Oil	31.12.57	6	4	Jan. 1	10
Natal Navig. Colls.	30. 6.57	10	10	Feb. 14	25(*b*)
S. Tronoh Tin	31.12.56	7½(*c*)	—	Jan. 8	27½
Tronoh Mines	31.12.56	7½(*d*)	15(*e*)	Jan. 11	47½
Zambesia Expl. (*f*)	31. 3.57	6	4	—	17½
Selection Trust (*g*)	31. 3.57	17½	17½	Jan. 18	60
S. Witbank Coal	30. 6.57	10	10	Feb. 22	22½
Ayer Hitam Tin	30. 6.56	5	10	Jan. 16	40
Sungei Besi Mines (*c*)	31. 3.57	15	10	Jan. 14	40
Taiping Cons.	31.12.56	15	15	—	30
Dominion Reefs	30. 6.56	25	25	Feb. 2	50
Gopeng Cons. (*i*)	30. 9.56	10	10	Jan. 4	50
Ampat Tin	31.12.56	17½	17½	Dec. 28	55
S. Kinta Cons.	31. 3.57	12½	12½	Dec. 28	82½
Kinta (*i*)	31.12.56	25	25	Dec. 29	75 (*j*)
Idris Hydraulic	31 12.56(*c*)	7½	20 (*k*)	Jan. 18	27½
Nchanga Cons.	31. 3.57	25	37½	Feb. 7	150
Rhodesia Broken Hill	31.12.56	8⅓	8⅓	Feb. 7	25

(*a*) 1st interim (*b*) Including 5% bonus (*c*) 2nd interim (*d*) 4th interim (*e*) including 7½% bonus (*f*) latest div. on larger capital. Increase does not indicate higher yearly total (*g*) latest div. on larger capital (*h*) Plus 2% tax free (*i*) 4th interim (*j*) Excluding 20% special dist. (*k*) including 7½% bonus.

(*Recent final dividends and preliminary figures appear on page 769*)

THE LAMPA MINING CO. LTD.

The 50th Annual General meeting of The Lampa Mining Co. Ltd., was held in Liverpool on December 20. The following are extracts from the circulated statement of the chairman, **Mr. J. Shirley Esplen** :—

Smelter Production

In last year's report, I informed shareholders that the Directors had instructed the construction of a third reverberatory furnace. I am pleased to inform the shareholders that the furnace came into operation in March. The total charge dealt with during the year has increased by approximately 5,500 tons, and recovery percentages have staged a considerable improvement.

New Plant

The news of this is still disappointing. However, the troubles encountered have all been of a mechanical nature, not unusual when dealing with a plant and process of novel and unique design.

Accounts

It is appropriate that on the 50th Anniversary of the Company we should be able to lay before the Shareholders a Statement of Profit and Loss and Balance Sheet more favourable by far than any of their predecessors. The Directors have thought it appropriate to signalize the occasion by a special Jubilee Cash Bonus of 20 per cent less tax in addition to the Ordinary Final Dividend, and by the proposal to make an issue of one fully paid share of £1 for every £2 of Stock at present issued.

Shareholders will appreciate that there is an exceptional element in the good results obtained during the past year, and that it would not be prudent to imagine that such successful results could be repeated. This is not, however, to suggest that our operations are not continuing on a satisfactory and profitable basis, and we hope that next year they will still give grounds for satisfaction.

THE CENTRAL MINING-RAND MINES GROUP

DECLARATION OF DIVIDENDS

NOTICE IS HEREBY GIVEN that DIVIDENDS have been declared payable to shareholders registered in the books of the undermentioned Companies at the close of business on 31st December, 1956, and to persons presenting the respective Coupons detached from Share Warrants. Dividends on shares included in Share Warrants will be paid in terms of a notice to be published later by the London Secretaries of the Companies.

The Dividends are declared in South African currency and become due on 2nd January, 1957. Payment from the Office of the London Secretaries will be in British currency at par provided that should there be any difference that may be regarded by the Boards as material between the two currencies on 2nd January, 1957, payment will be made on the basis of the equivalent British currency calculated at the rate of exchange ruling on that date.

Warrants in payment will be posted on or about 7th February, 1957, to shareholders at their registered addresses or in accordance with their written instructions. Warrants will be despatched from the Registered Office, Johannesburg, to addresses in Africa south of the Equator and from the Office of the London Secretaries to addresses elsewhere. Unless instructions, which will necessitate an alteration in the office from which payment is to be made, are accepted by the Companies on or before 31st December, 1956, payment will be made in accordance with existing instructions. Other changes of instructions to apply to these dividends must be received by the Companies not later than 24th January, 1957.

The Transfer Books and Register of Members will be closed in each case from 1st to 7th January, 1957, both days inclusive.

Name of Company (Each incorporated in the Union of South Africa)	*Dividend Number*	*Coupon Number*	*Dividend per share* s.	d.
Rand Mines, Limited	107	107	3	0
Blyvooruitzicht Gold Mining Company, Limited	22	—	1	0
City Deep, Limited	71	71		6
Consolidated Main Reef Mines and Estate, Limited	94	91	1	6
*Crown Mines, Limited	111	111	2	0
Durban Roodepoort Deep, Limited	72	72	1	6
East Rand Proprietary Mines, Limited	74	75	2	6
Modderfontein East, Limited	59	40	1	0
Transvaal Consolidated Land and Exploration Company Limited	34	34	3	0
†Transvaal Gold Mining Estates Limited	92	92		10

* Working profits during the last half of 1956 have been marginal and the dividend of 2s. 0d. per share has been declared out of accumulated profits.

† The dividend of 10d. per share represents the passing on to shareholders of income accrued to the Company in respect of the two S.A.F.I. dividends declared in July and December 1956 as opposed to the usual practice heretofore of passing on such income to shareholders six monthly in arrear.

BY ORDER OF THE BOARDS,
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CHIEF CHEMIST. A vacancy exists for the position of Chief Chemist with Kilembe Mines Ltd. Applicants should be fully capable of taking charge of the laboratory, and organizing and training staff. The Mine produces Copper and Cobalt and the successful applicant should be conversant with quantitative analysis of copper, cobalt and other base metals. Single applicants preferred. 3-year contract entered into, air passage paid, pension scheme, healthy climate. Apply in writing to General Manager, Kilembe Mines Ltd., P.O., Kilembe, Uganda, East Africa, giving full personal particulars, copies of references, experience gained, etc.

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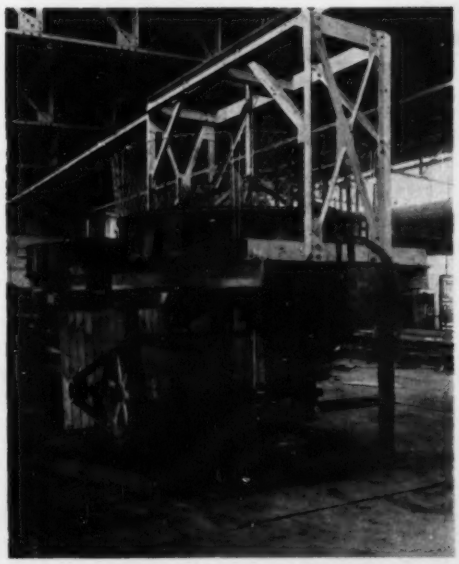

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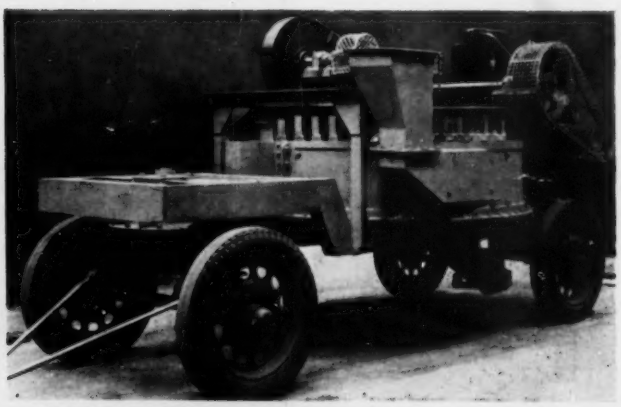

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